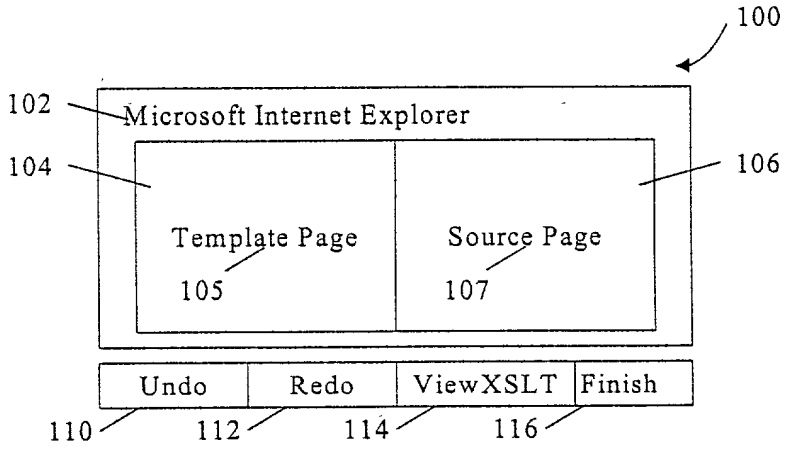

100
102
Microsoft Internet Explorer
104
106
Template Page
105
Source Page
107
Undo
Redo
ViewXSLT
Finish
110
112
114
116

FIG. 1

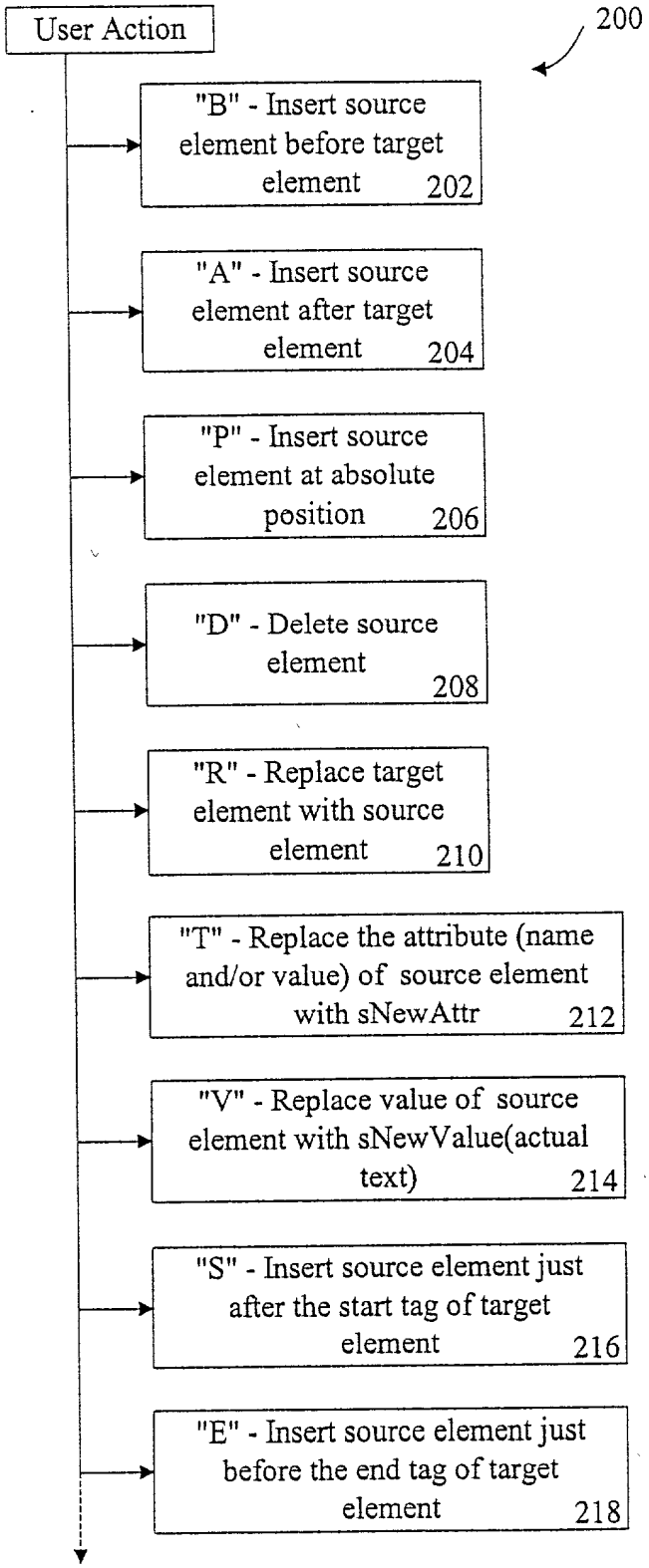

User Action
200
"B" - Insert source element before target element 202
"A" - Insert source element after target element 204
"P" - Insert source element at absolute position 206
"D" - Delete source element 208
"R" - Replace target element with source element 210
"T" - Replace the attribute (name and/or value) of source element with sNewAttr 212
"V" - Replace value of source element with sNewValue(actual text) 214
"S" - Insert source element just after the start tag of target element 216
"E" - Insert source element just before the end tag of target element 218

FIG. 2

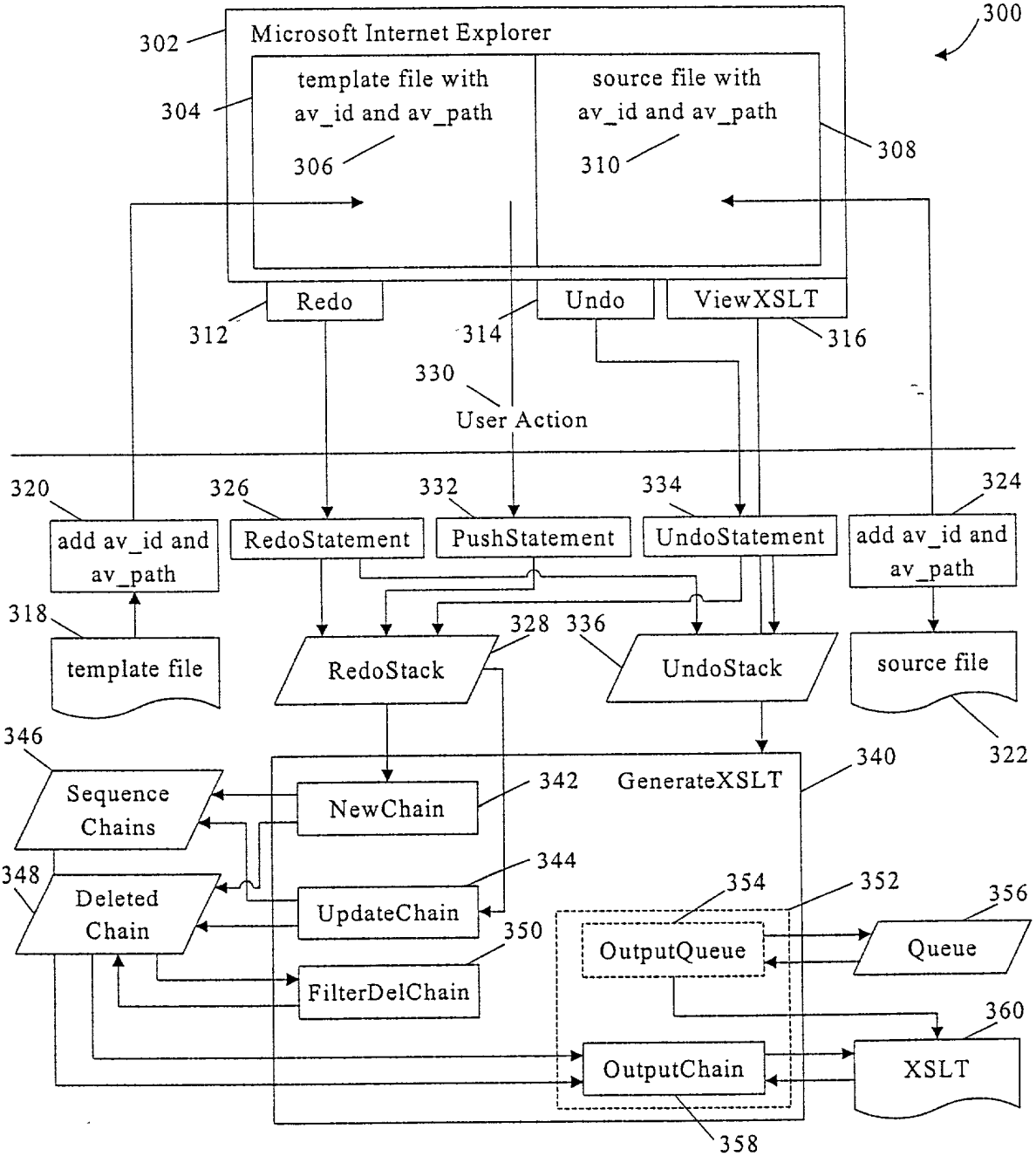

300
302
Microsoft Internet Explorer
304
template file with
av_id and av_path
306
source file with
av_id and av_path
310
308
Redo
312
Undo
314
ViewXSLT
316
330
User Action
320
add av_id and
av_path
326
RedoStatement
332
PushStatement
334
UndoStatement
324
add av_id and
av_path
318
template file
328
RedoStack
336
UndoStack
source file
322
346
Sequence
Chains
342
NewChain
340
GenerateXSLT
348
Deleted
Chain
344
UpdateChain
354
352
356
OutputQueue
Queue
350
FilterDelChain
360
OutputChain
XSLT
358

FIG. 3A

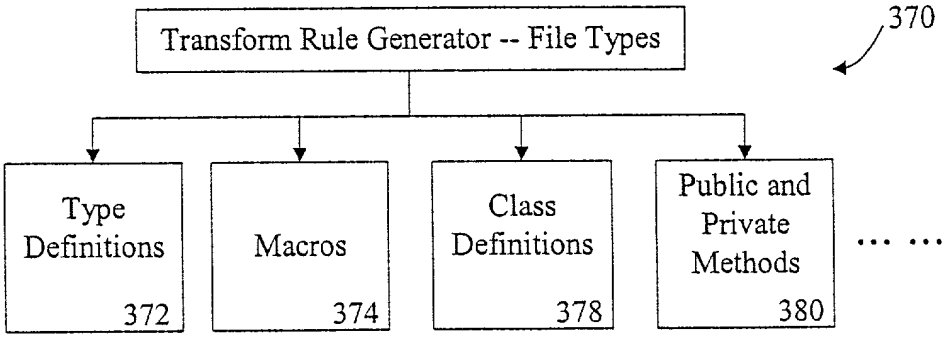

Transform Rule Generator -- File Types
370
Type Definitions
372
Macros
374
Class Definitions
378
Public and Private Methods
380
... ...

FIG. 3B

TagId

```
typedef struct _TagId{
    int         iPage;      // page /deck number
    int         iCard;      // card number for WML only
    int         iFamilyId;
    DOMString   sFrame;     //sample: i1.3.2
    DOMString   sNewTag;
    DOMString   sId;
    DOMString   sName;
    DOMString   sPath;      //sample: tmp/html[1]/body[1]
    DOMString   sAbsPos;
    bool        bIsChanged;
    bool        bIsAbsPosOrg;
    char        cAbsPos;
    int         x, y;
}TagId;
```

FIG. 4A

Statement

```
type defstruct_Statement{
    bool            bNewAction;
    char            cAction;
    struct _TagId   sourceEle;
    struct _TagId   targetEle;
    DOMString       *psNewAttrName;
    DOMString       *psNewAttrValue;
    int             iNumOfAttr;
    DOMString       sNewText;
    struct _Statement*pPrev;
    struct _Statement*pNext;
}Statement;
```

FIG. 4B

Stack

```
typedef struct _Stack{
    Statement       *pFirstStatement,
    Statement       *pLastStatement;
}Stack;
```

FIG. 4C

```
Element
typedef struct _Element{
    bool            bIsChainBase;
    char            cAction;
    TagId           Ele;
    struct _Chain   *pChildChain;
    struct _Attr    *pFirstAttr;
    struct _Attr    *pLastAttr;
    DOMString sNewText;
    struct _Element *pPrev;
    struct _Element *pNext;
}Element;
```

FIG. 4D

```
Chain
typedef struct _Chain{
    bool            bIsApplied;
    struct _Element *pChainBase;
    struct _Element *pFirstElement;
    struct _Element *pLastElement;
    struct _Chain   *pPrev;
    struct _Chain   *pNext;
}Chain;
```

FIG. 4E

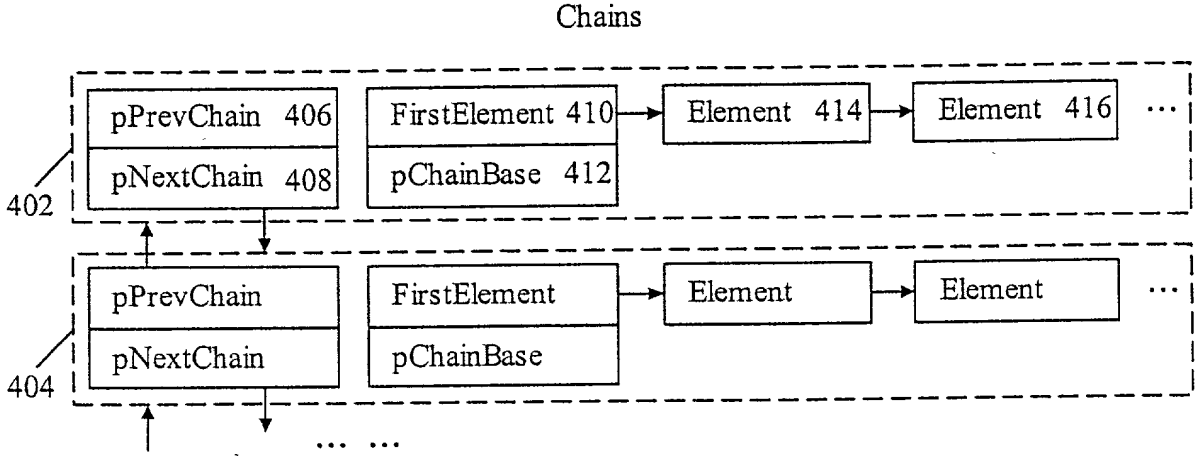


FIG. 4F

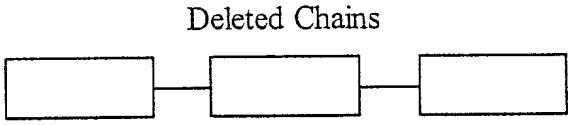


FIG. 4G

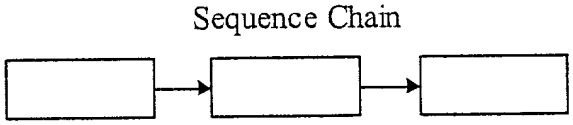


FIG. 4H

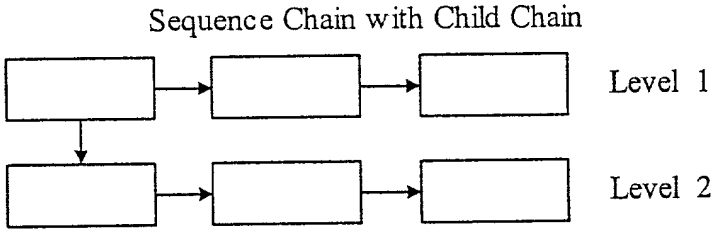


FIG. 4I

Card

```
typedef struct _Card{
    int             iCard;
    int             iEntry;
    struct _Chain   *pFirstChain;
    struct _Chain   *pLastChain;
    struct _Chain   DelChain;
    struct _Unit    *pFirstUnit;
    struct _Unit    *pLastUnit;
    struct _Card *pPrev;
    struct _Card    *pNext;
}Card;
```

FIG. 4J

Page

```
typedef struct _Page{
    int             iPage;
    struct _Card *pFirstCard;
    struct _Card *pLastCard;
    struct _Var   *pRootTmpVar;
    struct _Var   *pRootSrcVar;
    struct _Page *pPrev;
    struct _Page *pNext;
}Page;
```

FIG. 4K

```
                    Attr
typedef struct _Attr{
    DOMString       sAttrName;
    DOMString       sAttrValue;
    struct _Attr    *pPrev;
    struct _Attr    *pNext;
}Attr;
```

FIG. 4L

```
                    Unit
typedef struct _Unit{
    struct _Element  *pElement;
    struct _Unit     *pPrev;
    struct _Unit     *pNext
}Unit;
```

FIG. 4M

```
                    ElementInfo
typedef struct _ElementInfo{
    bool             bSourceEleIsLocated;
    bool             bTargetEleIsLocated;
    struct _TagId    sourceEle;
    struct _TagId    targetEle;
    struct _Element  *pSourceElement;
    struct _Element  *pTargetElement;
    struct _Chain    *pChainForSourceEle;
    struct _Chain    *pChainForTargetEle;
}ElementInfo;
```

FIG. 4N

```
                                Var
typedef struct _Var{
    int             iMaxFrame;
    int             iMaxIFrame;
    DOMString       sFrame;
    bool            bToOutput;
    struct _Var     *pPrev;
    struct _Var     *pNext;
    struct _Var     *pFirstFrame;
    struct _Var     *pLastFrame;
    struct _Var     *pFirstIFrame;
    struct _Var     *pLastIFrame;
}Var;
```

FIG. 4O

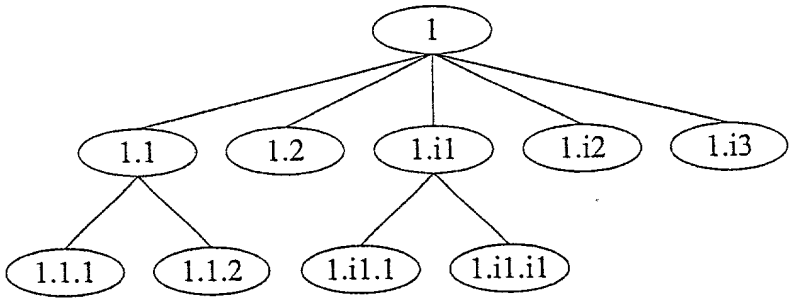


FIG. 4P

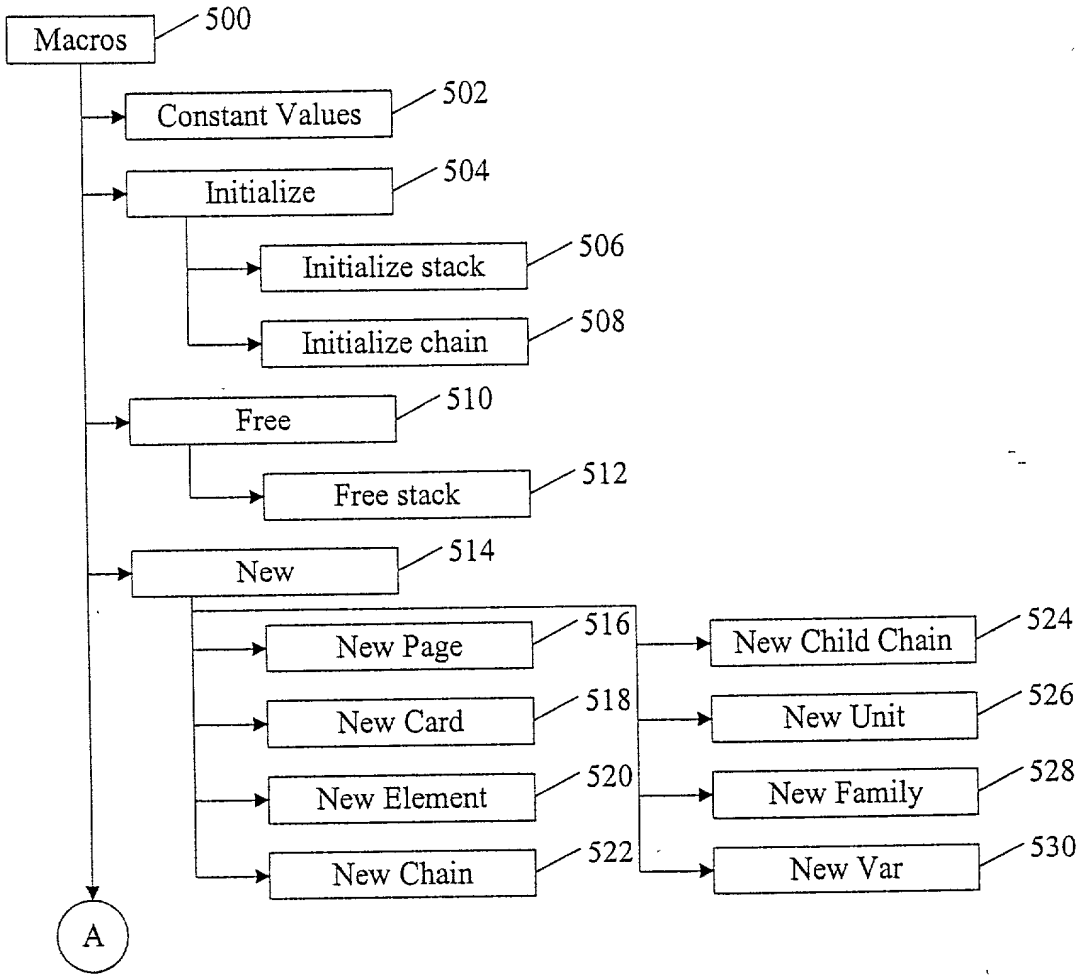

Macros
500
Constant Values
502
Initialize
504
Initialize stack
506
Initialize chain
508
Free
510
Free stack
512
New
514
New Page
516
New Card
518
New Element
520
New Chain
522
New Child Chain
524
New Unit
526
New Family
528
New Var
530
A

FIG. 5A

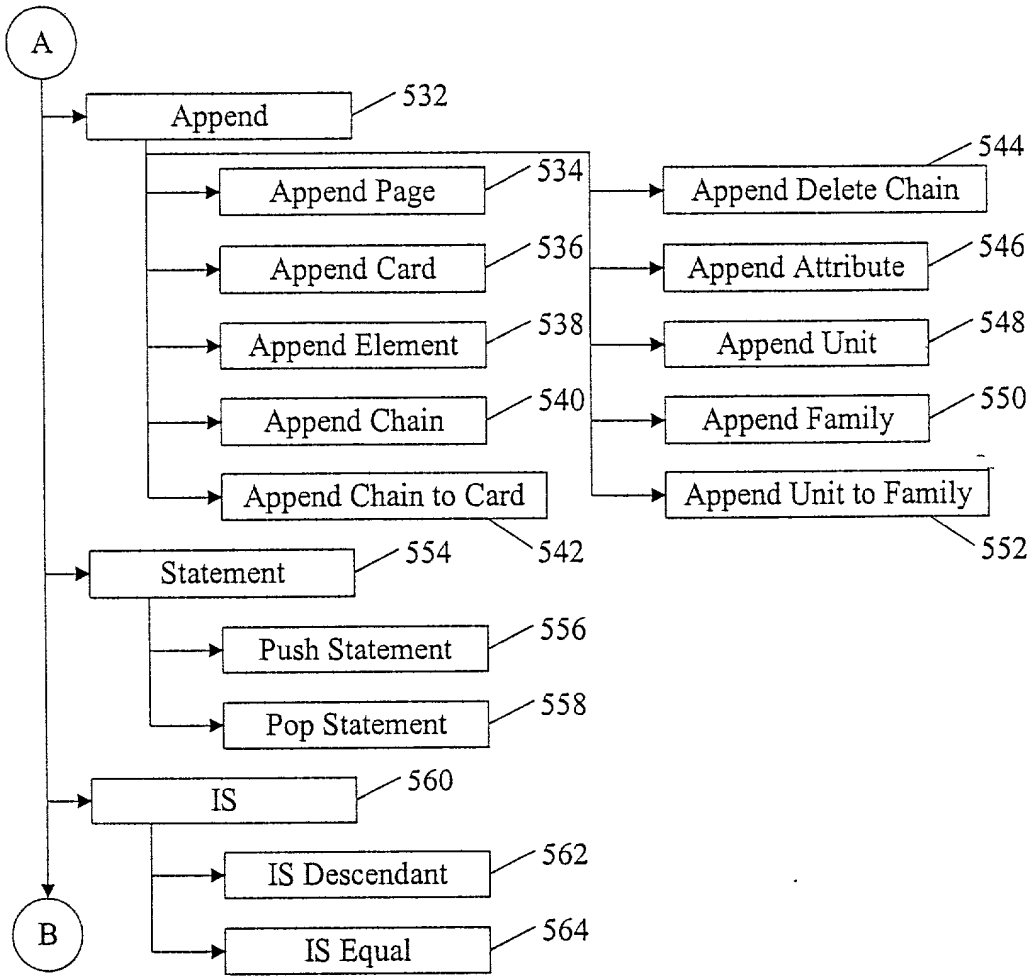

A
Append
532
Append Page
534
Append Card
536
Append Element
538
Append Chain
540
Append Chain to Card
542
Append Delete Chain
544
Append Attribute
546
Append Unit
548
Append Family
550
Append Unit to Family
552
Statement
554
Push Statement
556
Pop Statement
558
IS
560
IS Descendant
562
IS Equal
564
B

FIG. 5B

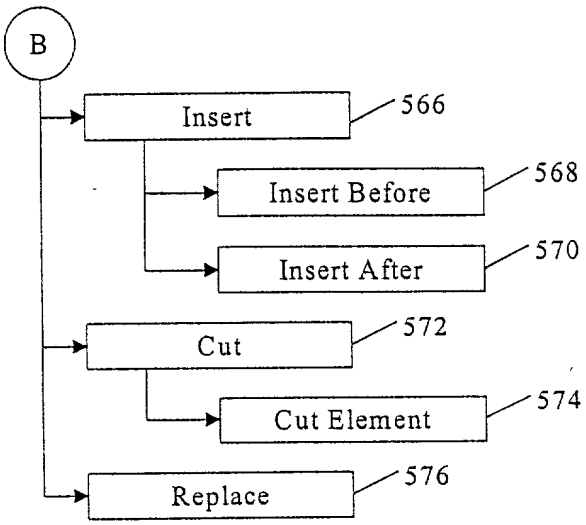

B
Insert
566
Insert Before
568
Insert After
570
Cut
572
Cut Element
574
Replace
576

FIG. 5C

```
Constructor
m_pFirstPage        = NULL;
m_pLastPage         = NULL;
m_pFirstChain       = NULL;
m_pLastChain        = NULL;
m_pFirstDelChain    = NULL;
m_pLastDelChain     = NULL;

m_bCanRedo = m_bCanUndo = false;
INIT_STACK(m_redoStack);
INIT_STACK(m_undoStack);

NEW_CHILD_CHAIN(m_pDelChain);
```

FIG. 6A

```
Deconstructor
FREE_STACK(m_redoStack);
FREE_STACK(m_undoStack);

for(pPage = m_pFirstPage; pPage != NULL; ){
    for(pCard = pPage->pFirstCard; pCard != NULL; ){
        for(pChain = pCard->pFirstChain; pChain != NULL; ){
            pChain = DeleteChain(pChain, pCard, FROM_CARD);
        }
        FREE(pPage->pFirstCard, pCard);
    }
    FREE(m_pFirstPage, pPage);
}
for(pChain = m_pFirstDelChain; pChain != NULL; )
    pChain = DeleteChain(pChain, NULL, FROM_M_PFIRSTDELCHAIN);
```

FIG. 6B

```
Statement Methods: B, A, R, S, E
//set statement
pStatement = new Statement;
pStatement->bNewAction = bNewAction;
pStatement->cAction = cAction;
pStatement->sourceEle = sourceEle;
pStatement->targetEle = targetEle;
pStatement->pPrev = 0;
pStatement->pNext = 0;

//Push into redoStack
PUSH_STATEMENT(redoStack, pStatement);

//set undo/redo
m_bCanUndo = true;

return;
```

FIG. 7A

Statement Methods: P, D

```
//set statement
pStatement = new Statement;
pStatement->bNewAction = bNewAction;
pStatement->cAction = cAction;
pStatement->sourceEle = sourceEle;
pStatement->targetEle = sourceEle;
pStatement->pPrev = 0;
pStatement->pNext = 0;

//Push into redoStack
PUSH_STATEMENT(redoStack, pStatement);

//set undo/redo
m_bCanUndo = true;

return;
```

FIG. 7B

Statement Methods: T

```
//set statement
pStatement = new Statement;
pStatement->bNewAction = bNewAction;
pStatement->cAction = 'T';
pStatement->sourceEle = sourceEle;
pStatement->targetEle = sourceEle;
pStatement->iNumOfAttr = iNumOfAttr;
pStatement->pPrev = 0;
pStatement->pNext = 0;

//allocate memory for psNewAttrName and psNewAttrValue of pStatement
pStatement->psNewAttrName = new DOMString[iNumOfAttr];
pStatement->psNewAttrValue = new DOMString[iNumOfAttr];

//set psNewAttrName and psNewAttrValue of pStatement
for(i=0;i<iNumOfAttr;i++){
    (pStatement->psNewAttrName)[i] = psNewAttrName[i];
    (pStatement->psNewAttrValue)[i] = psNewAttrValue[i];
}

//Push into redoStack
PUSH_STATEMENT(m_redoStack, pStatement);

//set undo/redo
m_bCanUndo = true;
return;
```

FIG. 7C

Statement Methods: V

```
//set statement
pStatement = new Statement;
pStatement->bNewAction = bNewAction;
pStatement->cAction = 'V';
pStatement->sourceEle = sourceEle;
pStatement->targetEle = sourceEle;
pStatement->sNewText = sNewText;
pStatement->pPrev = 0;
pStatement->pNext = 0;

//Push into redoStack
PUSH_STATEMENT(m_redoStack, pStatement);

//set undo/redo
m_bCanUndo = true;

return;
```

FIG. 7D

UndoStatement

```
//pop out from redoStack
POP_STATEMENT(m_redoStack, pStatement);

//push into undoStack
PUSH_STATEMENT(m_undoStack, pStatement);

//set redo/undo
m_bCanRedo = true;
if(m_redoStack.pFirstStatement == NULL)
    m_iCanUndo = false;
return;
```

FIG. 8A

RedoStatement

```
//pop out from undoStack
POP_STATEMENT(m_undoStack, pStatement);

//push into redoStack
PUSH_STATEMENT(m_redoStack, pStatement);

//set redo/undo
m_bCanUndo = true;
if(m_undoStack.pFirstStatement == NULL)
    m_iCanRedo = false;
return;
```

FIG. 8B

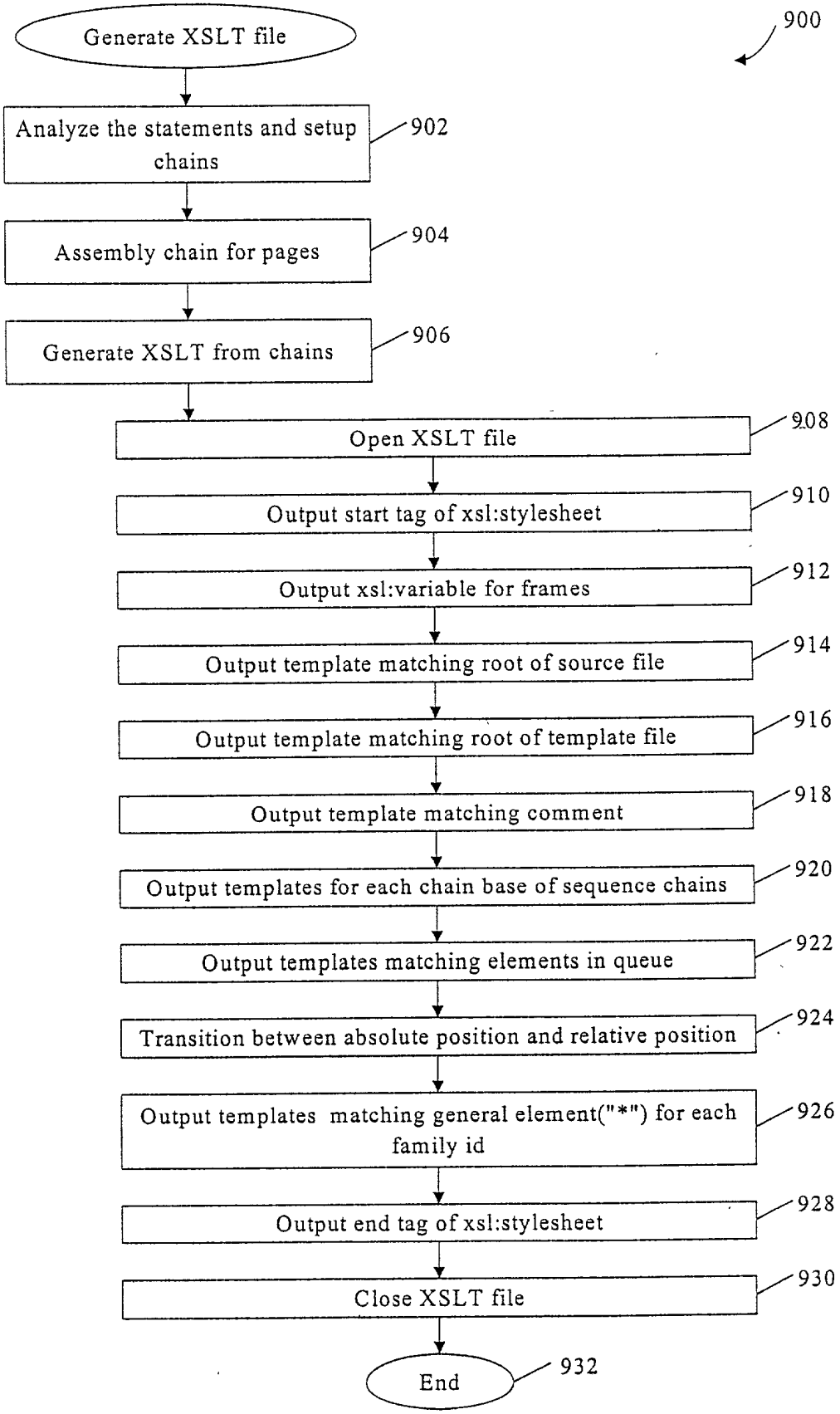

Generate XSLT file
900
Analyze the statements and setup chains
902
Assembly chain for pages
904
Generate XSLT from chains
906
Open XSLT file
908
Output start tag of xsl:stylesheet
910
Output xsl:variable for frames
912
Output template matching root of source file
914
Output template matching root of template file
916
Output template matching comment
918
Output templates for each chain base of sequence chains
920
Output templates matching elements in queue
922
Transition between absolute position and relative position
924
Output templates matching general element("*") for each family id
926
Output end tag of xsl:stylesheet
928
Close XSLT file
930
End
932

FIG. 9A

GenerateXSLT: Step 1

```
//step 1.1: loop from the first statement to the last statement to assembly sequence chains and
deleted chains
pCurrStatement = m_redoStack.pFirstStatement;
while(pCurrStatement != NULL){
    //step 1.1.1: assembly elementInfo
    elementInfo.sourceEle = pCurrStatement->sourceEle;
    elementInfo.targetEle = pCurrStatement->targetEle;
    elementInfo.pSourceElement = NULL;
    elementInfo.pChainForSourceEle = NULL;
    elementInfo.pTargetElement = NULL;
    elementInfo.pChainForTargetEle = NULL;
    //iPage equals 0 means that the element is from source page
    if(elementInfo.sourceEle.iPage == 0)
        elementInfo.bSourceEleIsLocated = true;
else
        elementInfo.bTargetEleIsLocated = false;
    //targetEle's iPage is impossible to be = 0
    elementInfo.bTargetEleIsLocated = false;

//step 1.1.2: Check whether sourceEle and targetEle are in sequence chains and call methods.
LocateElement(m_pFirstChain, &elementInfo);

//if targetEle is not in any sequence chain, call NewChain, otherwise call UpdateChain
if(elementInfo.pTargetElement == NULL)
        NewChain(&elementInfo, pCurrStatement);
else{
        UpdateChain(&elementInfo, pCurrStatement);
}
    //step 1.1.3: Transit to the next statement
    pCurrStatement = pCurrStatement->pNext;
}//end of while

//step 1.2: Filter the deleted chain
FilterDelChain(pPage);
```

FIG. 9B

GenerateXSLT: Step 3.4 – 3.5

Step 3.4 Output template matching root of source page

Format

```
<xsl:template match="/">
    <xsl:apply-templates select="$tmp/*" mode="tmp_root_output"/>
</xsl:template>
```

Step 3.5 Output template matching root of template page

Format

```
<xsl:template match="*" mode="tmp_root_output">
    <xsl:copy>
    <xsl:for-each select="@*"><xsl:copy/></xsl:for-each>
    <xsl:apply-templates select="//comment()"/>
    <xsl:apply-templates select=*|text()" mode="tmp_test_# "/>
    ……
    </xsl:copy>
</xsl:template>
```

FIG. 9C

GenerateXSLT: Step 3.6 – 3.7

Step 3.6 Output template matching comment

Step 3.7 Output templates for each chain base of sequence chains

Format

```
<xsl:template match="chain base's path" mode="XY_base_##">
    <xsl:apply-templates select="the path of the Element in the chain" mode="xy_output_#"/>
    ... ...
</xsl:template>
```

FIG. 9D

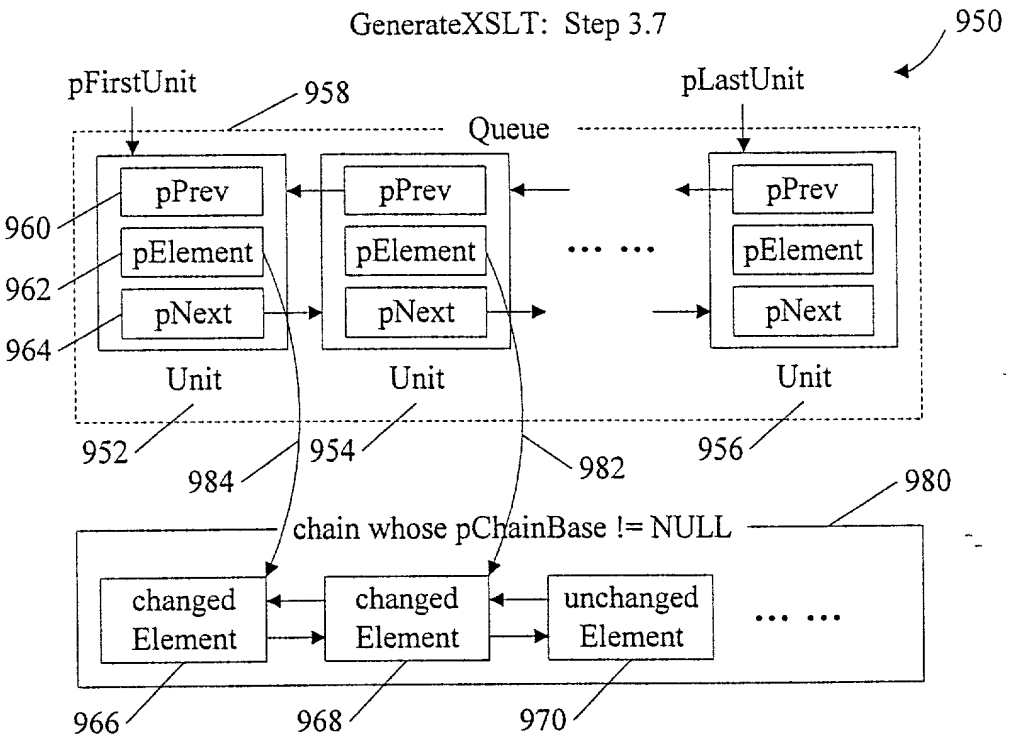

GenerateXSLT: Step 3.7
950
pFirstUnit
958
pLastUnit
Queue
pPrev
pElement
pNext
960
962
964
Unit
952
954
956
984
982
980
chain whose pChainBase != NULL
changed Element
unchanged Element
966
968
970

FIG. 9E

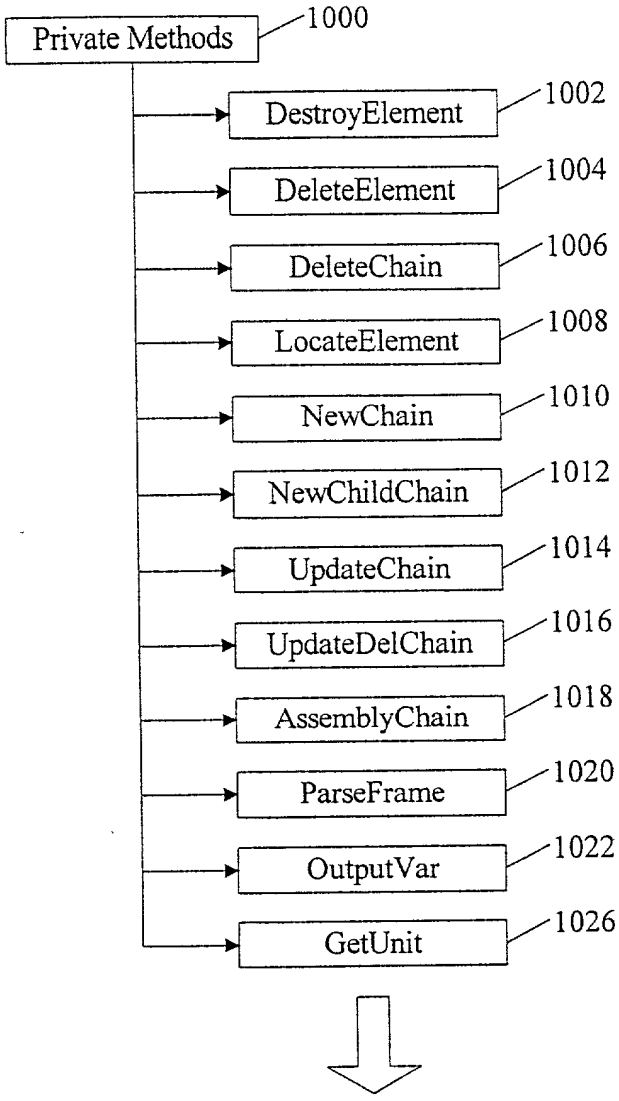

Private Methods
1000
DestroyElement
1002
DeleteElement
1004
DeleteChain
1006
LocateElement
1008
NewChain
1010
NewChildChain
1012
UpdateChain
1014
UpdateDelChain
1016
AssemblyChain
1018
ParseFrame
1020
OutputVar
1022
GetUnit
1026

FIG. 10

```
DestroyElement
if(pElement->pChildChain) DeleteChain(pElement->pChildChain);
free(pElement);
```

FIG. 11A

```
DeleteElement
Step 1. Cut the Element from the chain.
pNext = pElement->pNext;
CUT(pChain->pFirstElement, pChain->pLastElement, pElement);
Step 2. Destory it.
DestroyElement(pElement);
Step 3. Finally return the pointer to the next Element.
return pNext;
```

FIG. 11B

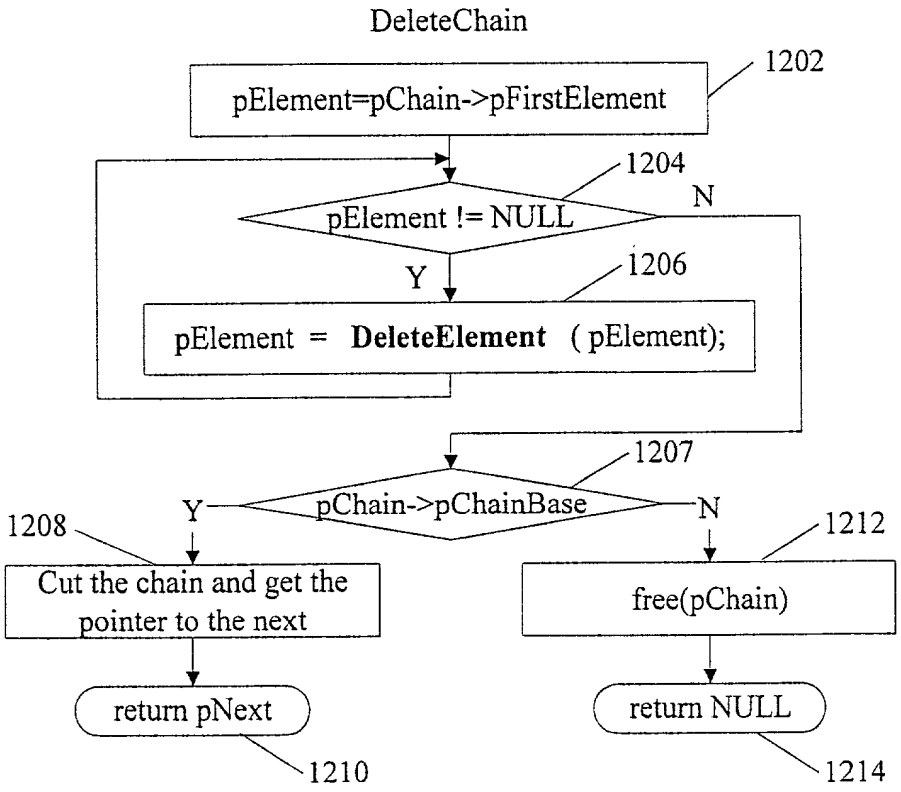


FIG. 12A

DeleteChain

```
pElement = pChain->pFirstElement;
//delete all Elements in this chain
while(pElement){
    pElement = DeleteElement(pChain, pElement);//return the next Element.
}
//delete the chain
if(pChain->pChainBase == NULL){//it is a child chain or Deleted Chain
    free(pChain);
    return NULL;
}
else{
    free(pChain->pChainBase);
    pNext = pChain->pNext;
    switch(mode){
        case FROM_M_PFIRSTCHAIN:
            CUT(m_pFirstChain, m_pLastChain, pChain);
            break;
        case FROM_CARD:
            CUT(pCard->pFirstChain, pCard->pLastChain, pChain);
            break;
        case FROM_M_PFIRSTDELCHAIN:
            CUT(m_pFirstDelChain, m_pDelLastChain, pChain);
            break;

        }
    free(pChain);
    return pNext;//MAY be NULL
}
```

FIG. 12B

```
LocateElement(1)
sourceEle = pElementInfo->sourceEle;
targetEle = pElementInfo->targetEle;
bSourceEleIsLocated = pElementInfo->bSourceEleIsLocated;
bTargetEleIsLocated = pElementInfo->bTargetEleIsLocated;
//loop for all sequence chains
for(pRefChain = pChain; pRefChain != NULL; pRefChain = pRefChain->pNext){
    //set bToLocateSourceEle and bToLocateTargetEle
    if(pRefChain->pChainBase){
        if(bTargetEleIsLocated == false &&
        pRefChain->pChainBase->Ele.iPage == targetEle.iPage &&
        pRefChain->pChainBase->Ele.iCard == targetEle.iCard)
            bToLocateTargetEle = true;
        else
            bToLocateTargetEle = false;

        if(bSourceEleIsLocated == false &&
        pRefChain->pChainBase->Ele.iPage == sourceEle.iPage &&
        pRefChain->pChainBase->Ele.iCard == sourceEle.iCard)
            bToLocateSourceEle = true;
        else
            bToLocateSourceEle = false;
    }
    else{
        bToLocateSourceEle = !bSourceEleIsLocated;
        bToLocateTargetEle = !bTargetEleIsLocated;
    }
    //if bToLocateSourceEle or bToLocateTargetEle is not true, search in this chain
    if(bToLocateSourceEle || bToLocateTargetEle){
        //loop for all Elements in this chain
        pRefElement = pRefChain->pFirstElement;
        for( ; pRefElement; pRefElement = pRefElement->pNext){
            if(bToLocateSourceEle){
                if(IS_EQUAL(pRefElement->Ele, sourceEle)){
                    pElementInfo->pSourceElement = pRefElement;
                    pElementInfo->pChainForSourceEle = pRefChain;
                    pElementInfo->bSourceEleIsLocated = true;
                    bSourceEleIsLocated = true;
                }
```

FIG. 13A

```
            }
            if(bToLocateTargetEle){
                if(IS_EQUAL(pRefElement->Ele, targetEle)){
                    pElementInfo->pTargetElement = pRefElement;
                    pElementInfo->pChainForTargetEle = pRefChain;
                    pElementInfo->bTargetEleIsLocated = true;
                    bTargetEleIsLocated = true;
                }
            }
        //if bToLocateSourceEle or bToLocateTargetEle is not true and this Element
            has child chain, recursively call to search in the child chain.
        if(pRefElement->pChildChain && (!bSourceEleIsLocated || !bTargetEleIsLocated))
            LocateElement(pRefElement->pChildChain, pElementInfo);
        //if both are found, return, otherwise transit to the next Element.
        if((pElementInfo->bSourceEleIsLocated) && (pElementInfo->bTargetEleIsLocated))
            return;
        }//end of loop for pRefElement
    }//end of if(bToLocateSourceEle || bToLocateTargetEle)
}//end of loop for sequence chains
else{
    //impossible to be here.
}
```

FIG. 13B

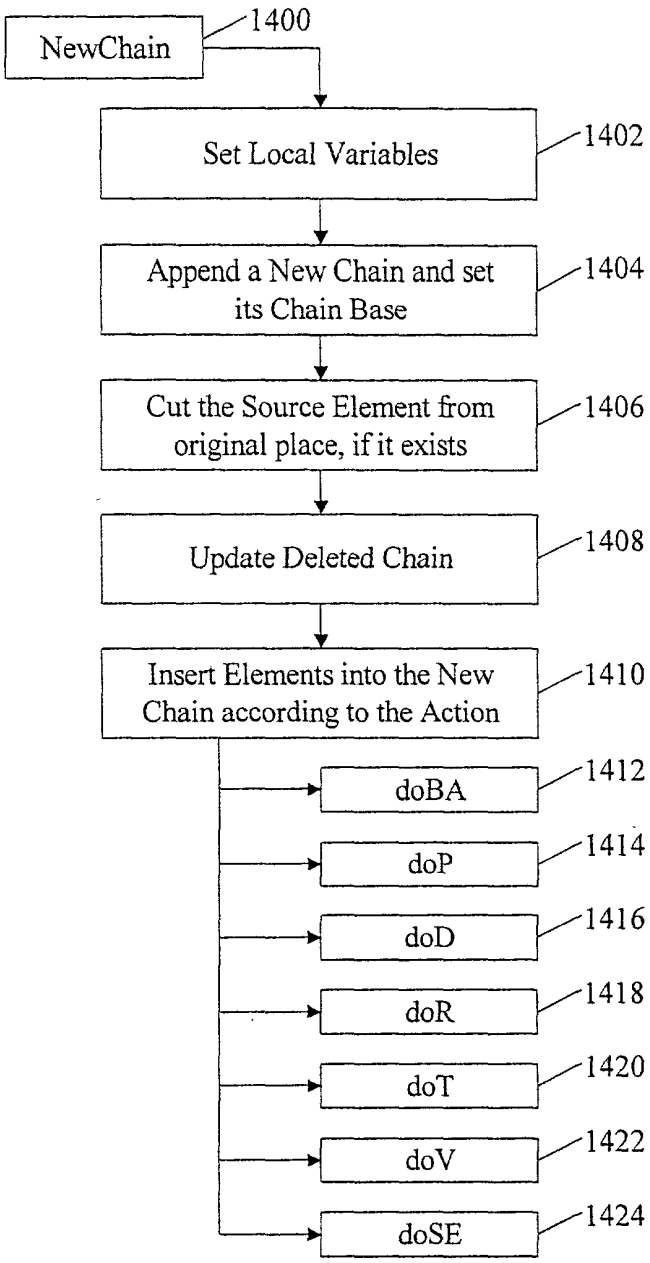

NewChain
1400
Set Local Variables
1402
Append a New Chain and set its Chain Base
1404
Cut the Source Element from original place, if it exists
1406
Update Deleted Chain
1408
Insert Elements into the New Chain according to the Action
1410
doBA
1412
doP
1414
doD
1416
doR
1418
doT
1420
doV
1422
doSE
1424

FIG. 14A

NewChain(1)

Step 1.: Set local variables

```
sourceEle = pStatement->sourceEle; targetEle = pStatement->targetEle;
cAction = pStatement->cAction;
pSourceElement = pElementInfo->pSourceElement;
pTargetElement = pElementInfo->pTargetElement;
```

Step 2. Append a new chain and set its chain base.

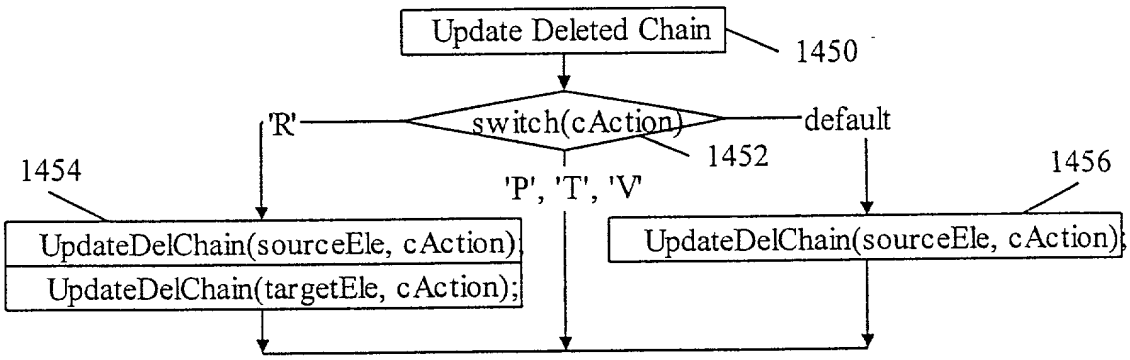
```
if(cAction != 'D'){
    NEW_CHAIN(pChain, targetEle);
    APPEND_CHAIN(pChain);
}
```

Step 3. Cut the source Element from the original place if it exists

```
if(pSourceElement &&
    (cAction == 'B' || cAction == 'A' || cAction == 'S' || cAction == 'E' ||
    cAction == 'R' || cAction == 'D')
    ){
    //Cut the Element from the original place.
    CUT(pElementInfo->pChainForSourceEle->pFirstElement,
        pElementInfo->pChainForSourceEle->pLastElement,
        pSourceElement);
}
//other actions are PTV
```

Step 4. Update deleted chain

Flowchart



Pseudo code

```
switch(cAction){
    case 'R': UpdateDelChain(sourceEle, cAction);
              UpdateDelChain(targetEle, cAction); break;
    case 'P':
case 'T':
    case 'V': break;
    default: UpdateDelChain(sourceEle, cAction); break;//'B', 'A', 'S', 'E', 'D'
}
```

FIG. 14B

NewChain(2)

Step 5. Insert Elements into the new chain according to the action

Top level flowchart for this step

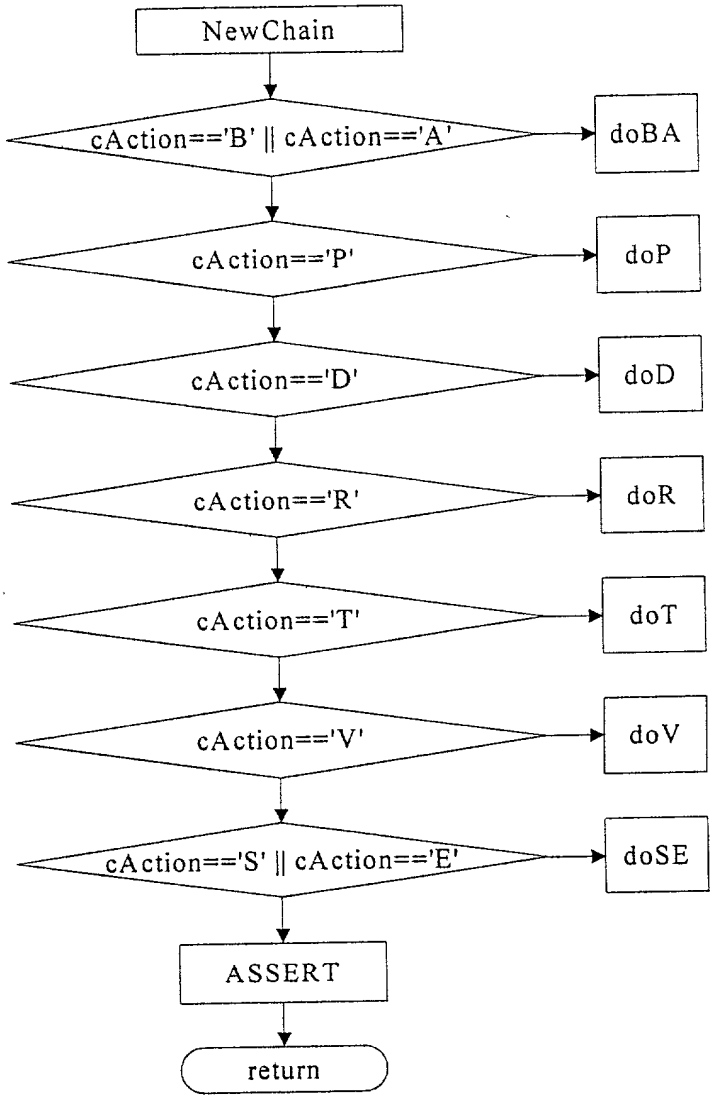


FIG. 14C

Basic Rules for Operation in NewChain

attr: attribute
cA: cAction
SE: sourceEle
TE: targetEle
EE: emptyEle
AP: absolute position
RP: relative position
X(AP): X(sourceEle or targetEle or 'div') with absolute position
X(RP): X(sourceEle or targetEle or 'div') with relative position
XAP: if X(sourceEle or targetEle) has absolute position
XRP: if X(sourceEle or targetEle) has relative position
→X: insert *Element*(X) into the current chain
→X→Y: insert *Element*(X) and *Element*(Y)into the current chain orderly
AP(X): X's absolute position attribute
N_C: NEW_CHAIN(), append the new chain and set its chainBase.
'X': if cAction is 'X'
YES(X), NOT(X): X is true, false;
X(Y): change X's attribute Y.
X(AP)=X(RP)+AP(Y): add Y's absolute position attribute to X.
X(AP)=X(RP)+AP; add user action's AP to X
X(RP)=X(AP)-AP: delete X's AP attribute, then X(AP) becomes X(RP)
→X[→Y→Z]: insert an *Element*(X), into which two children: *Element*(Y) and *Element*(Z) are inserted.
→TE[cA, →SE]: when cA equals 'S', this abbreviation equals →TE[→SE→EE], when cA equals 'E', this abbreviation equals →TE[→EE→SE]
//X: X is comment

FIG. 14D

SE's position	TE's position	Final positon of *Element*(targetEle) or *Element*(div)
RP	RP	RP
AP	RP	RP
RP	AP	AP
AP	AP	targetEle's AP

FIG. 14E

3. Examples

After new a chain and set its chain base, insert Elements into the new chain according to the following table.

In this table, "content" means the attributes and text.

In the 2nd column of this table, "□" means the row involves absolute position.

Action	What user wants to do	What Rule Generator does
B	Insert SE(RP) before TE(RP)	→SE(RP)→TE(RP)
	□Insert SE(RP) before TE(AP)	AP(div)=AP(TE); TE(RP)=TE(AP)-AP; →div(AP)[→SE(RP)→TE(RP)]
	□Insert SE(AP) before TE(RP)	SE(RP)=SE(AP)-AP; →SE(RP)→TE(RP)
	□Insert SE(AP) before TE(AP)	AP(div)=AP(TE); SE(RP)=SE(AP)-AP; TE(RP)=TE(AP)-AP; →div(AP)[→SE(RP)→TE(RP)] //use a div to wrap SE and TE
A	simliar as B	
P	□move SE(RP) to AP	SE(AP)=SE(RP)+AP; →SE(AP);
	□move SE(AP) to another AP	SE(AP); →SE(AP);
D	Delete this element	
R	Use SE(RP) to replace TE(RP)	→SE(RP);

	□Use SE(RP) to replace TE(AP)	SE(AP)=SE(RP)+AP(TE); //SE(RP) becomes SE(AP)
		→SE(AP)

	□Use SE(AP) to replace TE(RP)	SE(RP)=SE(AP)-AP; //SE(AP) becomes SE(RP)
		→SE(RP)

	□Use SE(AP) to replace TE(AP)	AP(SE)=AP(TE) →SE(AP)
T	Change SE' attr	doD; //nothing to do with AP and RP
V	Replace SE's text	doV; //nothing to do with AP and RP
S	Insert SE(RP) to be child of TE(RP)	→TE(RP)[→SE(RP)→EE]
	□Insert SE(RP) to be child of TE(AP)	→TE(AP)[→SE(RP)→EE]
	□Insert SE(AP) to be child of TE(RP)	SE(RP)=SE(AP)-AP; →TE(RP)[→SE(RP)→EE]
	□Insert SE(AP) to be child of TE(AP)	SE(RP)=SE(AP)-AP; →TE(AP)[→SE(RP)→EE]
E	similar as S	

FIG. 14F

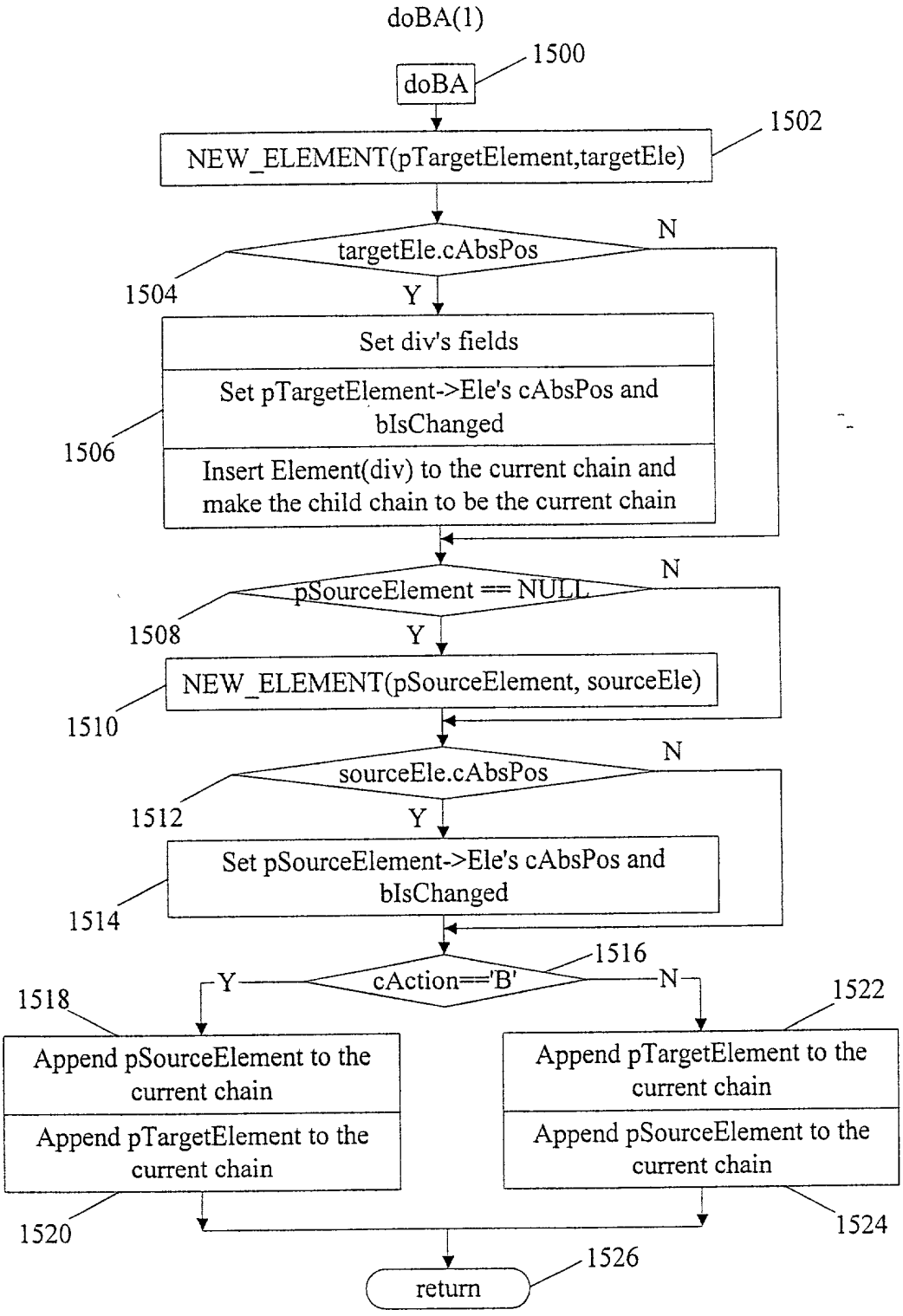

doBA(1)
doBA
1500
NEW_ELEMENT(pTargetElement,targetEle)
1502
targetEle.cAbsPos
N
1504
Y
Set div's fields
Set pTargetElement->Ele's cAbsPos and bIsChanged
1506
Insert Element(div) to the current chain and make the child chain to be the current chain
pSourceElement == NULL
N
1508
Y
NEW_ELEMENT(pSourceElement, sourceEle)
1510
sourceEle.cAbsPos
N
1512
Y
Set pSourceElement->Ele's cAbsPos and bIsChanged
1514
cAction=='B'
1516
Y
N
1518
Append pSourceElement to the current chain
Append pTargetElement to the current chain
1520
1522
Append pTargetElement to the current chain
Append pSourceElement to the current chain
1524
return
1526

FIG. 15A

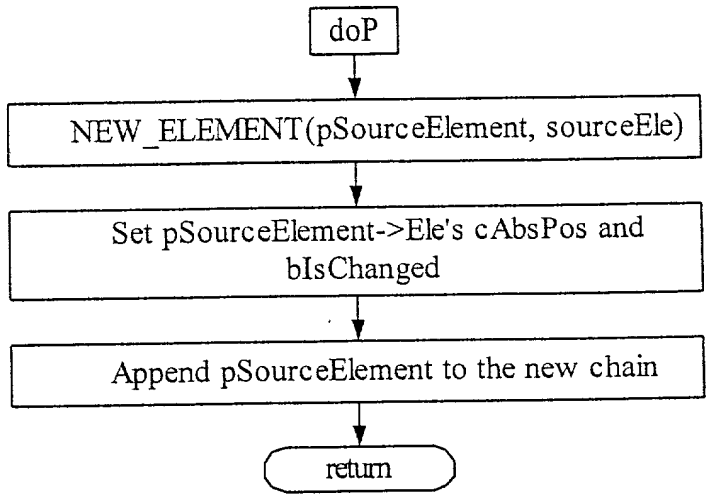
doBA(2)

```
Pseudo code
//if targetEle has absolute position, a div will be used to wrap sourceEle and targetEle
//The caller of Rule Generator sets the field cAbsPos to indicate the position status of the element: absolute position or relative position
NEW_ELEMENT(pTargetElement, targetEle);

if(targetEle.cAbsPos){
    //set tag name
    div.sNewTag = "div";
    //Because targetEle does not exist in any chain, the reference absolute position is used for div
    div.cAbsPos = REF_ABS_POS;
    div.sAbsPos = targetEle.sPath;
    //Set div's sFrame and sPath
    div.sFrame = targetEle.sFrame;
    div.sPath = targetEle.sPath;
    //set bIsAbsPosOrg and cAbsPos to indicate that the absolute position attribute shall not be output when xslt is applied.
    pTargetElement->Ele.cAbsPos = NO_ABS_POS;

    //set bIsChanged to indicate targetEle is changed.
    pTargetElement->Ele.bIsChanged = true;

    //new an Element for div and append to the current new chain
    NEW_ELEMENT(pDivElement, targetEle);
    pDivElement->bIsChainBase= true;
    APPEND_ELEMENT(pChain, pDivElement);

    //make a new chain to be the child chain of div
    pChain = new chain;
    pDivElement->pChildChain = pChain;
}
else //!!
    pTargetElement->bIsChainBase = true;

//if sourceEle does not exist in any chain, make a new Element for sourceEle
if( ! pSourceElement){
    NEW_ELEMENT(pSourceElement, sourceEle);
}
```

FIG. 15B

```
doBA(3)
//if sourceEle is absolute position, set bIsAbsPosOrg, cAbsPos and bIsChanged to indicate that
the absolute position attribute of sourceEle shall not be output and sourceEle is changed.
if(sourceEle.cAbsPos){
    pSourceElement->Ele.cAbsPos = NO_ABS_POS;
    pSourceElement->Ele.bIsChanged = true;
}

//append pSourceElement and pTargetElement according to the action
if(cAction == 'B'){
    APPEND_ELEMENT(pChain, pSourceElement);
    APPEND_ELEMENT(pChain, pTargetElement);
}
else{
    APPEND_ELEMENT(pChain, pTargetElement);
    APPEND_ELEMENT(pChain, pSourceElement);
}
```

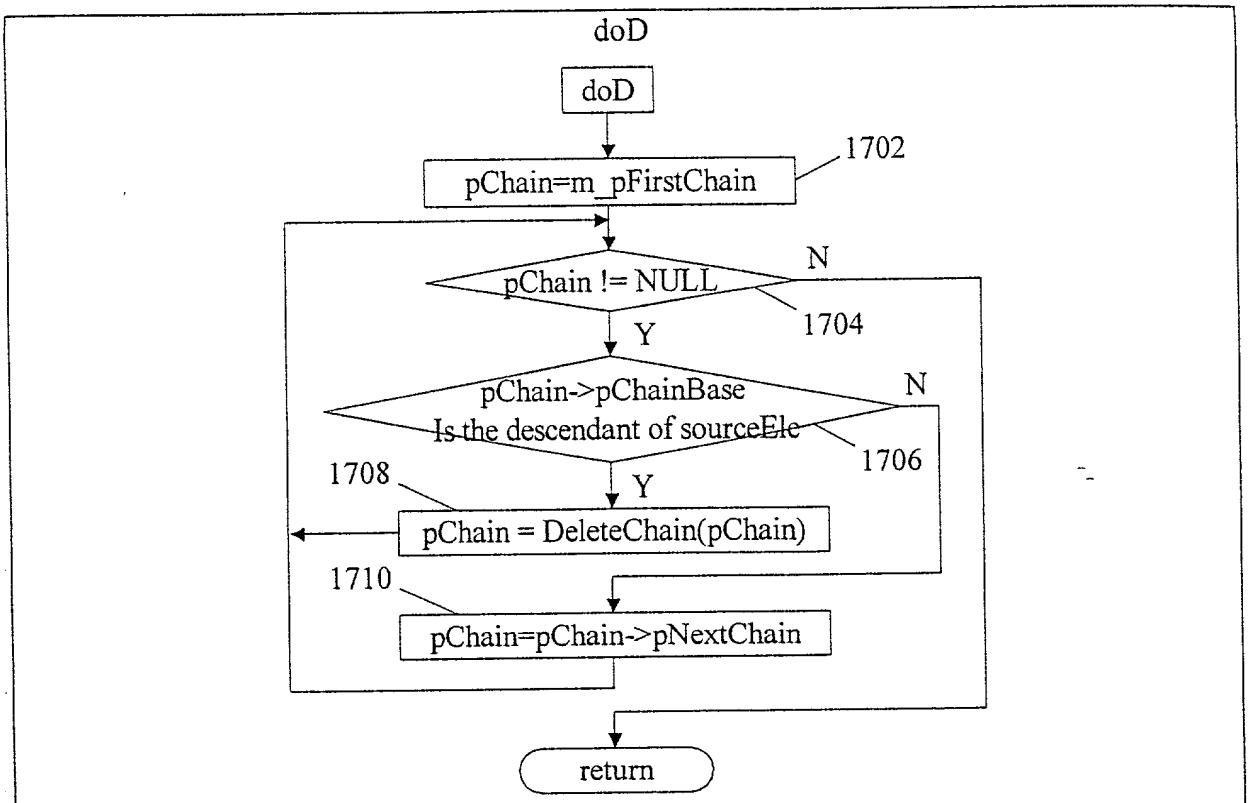
FIG. 15C



Pseudo code
When the statement is pushed into the redoStack, if the action is PTV, sourceEle and targetEle is set to the same value. So when targetEle is not found in any chain, the sourceEle shall not appear in any chain. Therefore a new *Element* is made for sourceEle.

```
NEW_ELEMENT(pSourceElement, sourceEle);
pSourceElement->Ele.cAbsPos = REAL_ABS_POS;
pSourceElement->Ele.bIsChanged = true;
//the position (x, y) has been set by the caller of Rule Generator.

pSourceElement->bIsChainBase = true;
APPEND_ELEMENT(pChain, pSourceElement);
```

FIG. 16

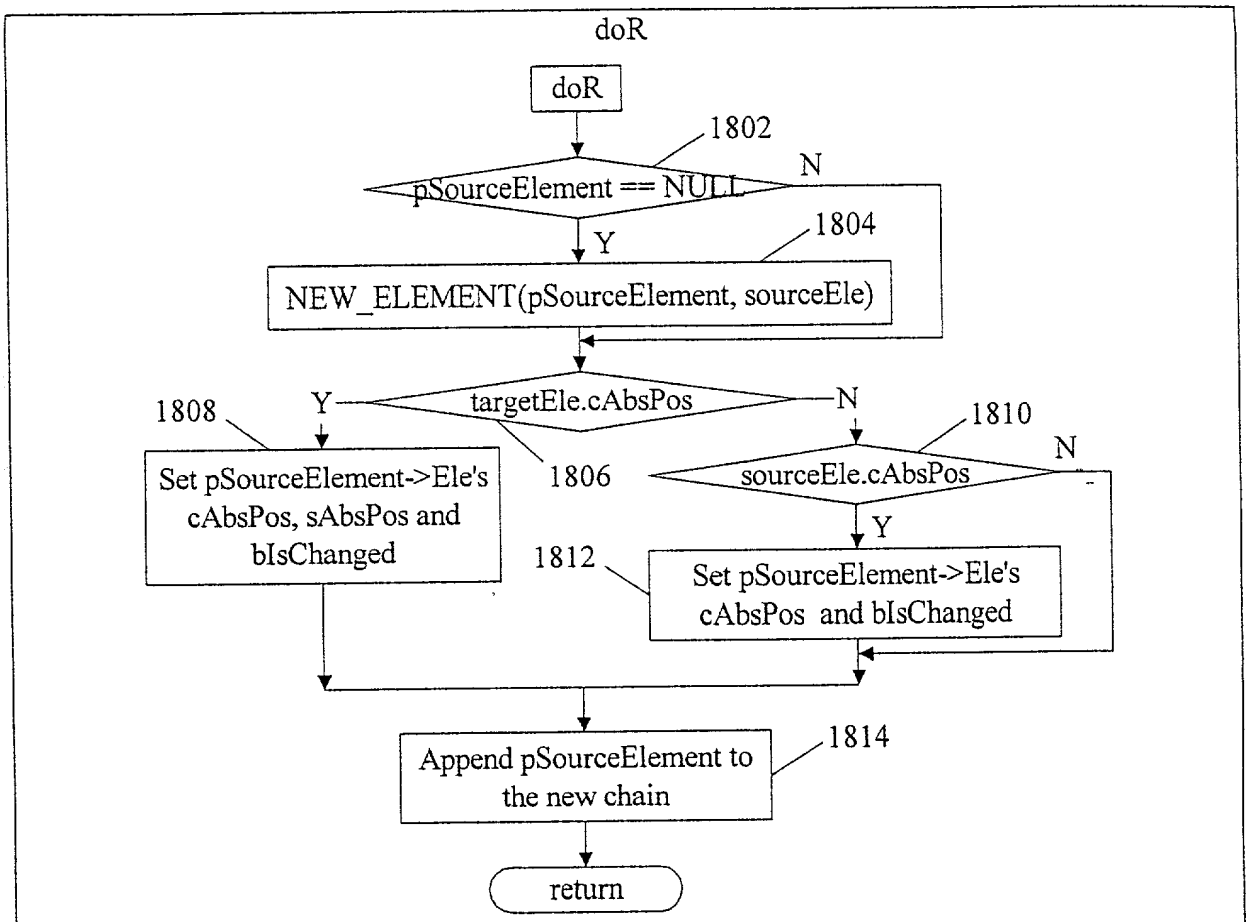


Pseudo Code

Check all chains. If the chain base of a chain is the descendant of sourceEle, delete that chain.

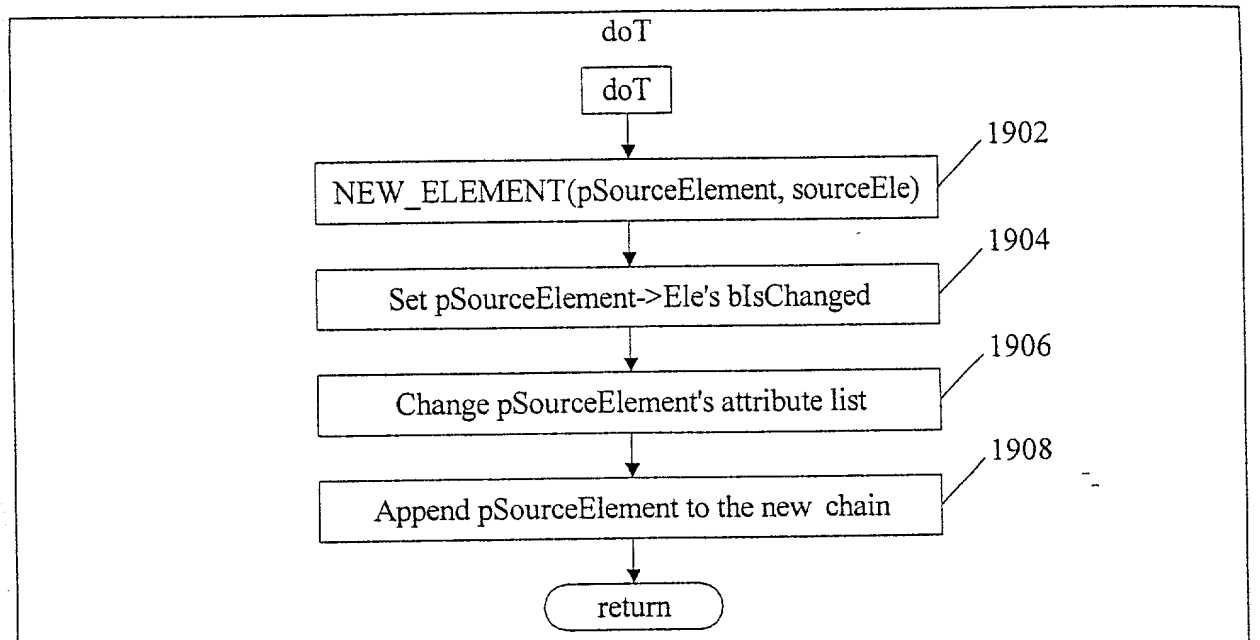
```
for(pChain = m_pFirstChain; pChain != NULL;){
    if(IS_DESCENDANT (pChain->pChainBase->Ele, sourceEle))
        pChain = DeleteChain(pChain);//return the pointer of the next chain
    else
        pChain = pChain->pNext;
}
```

FIG. 17



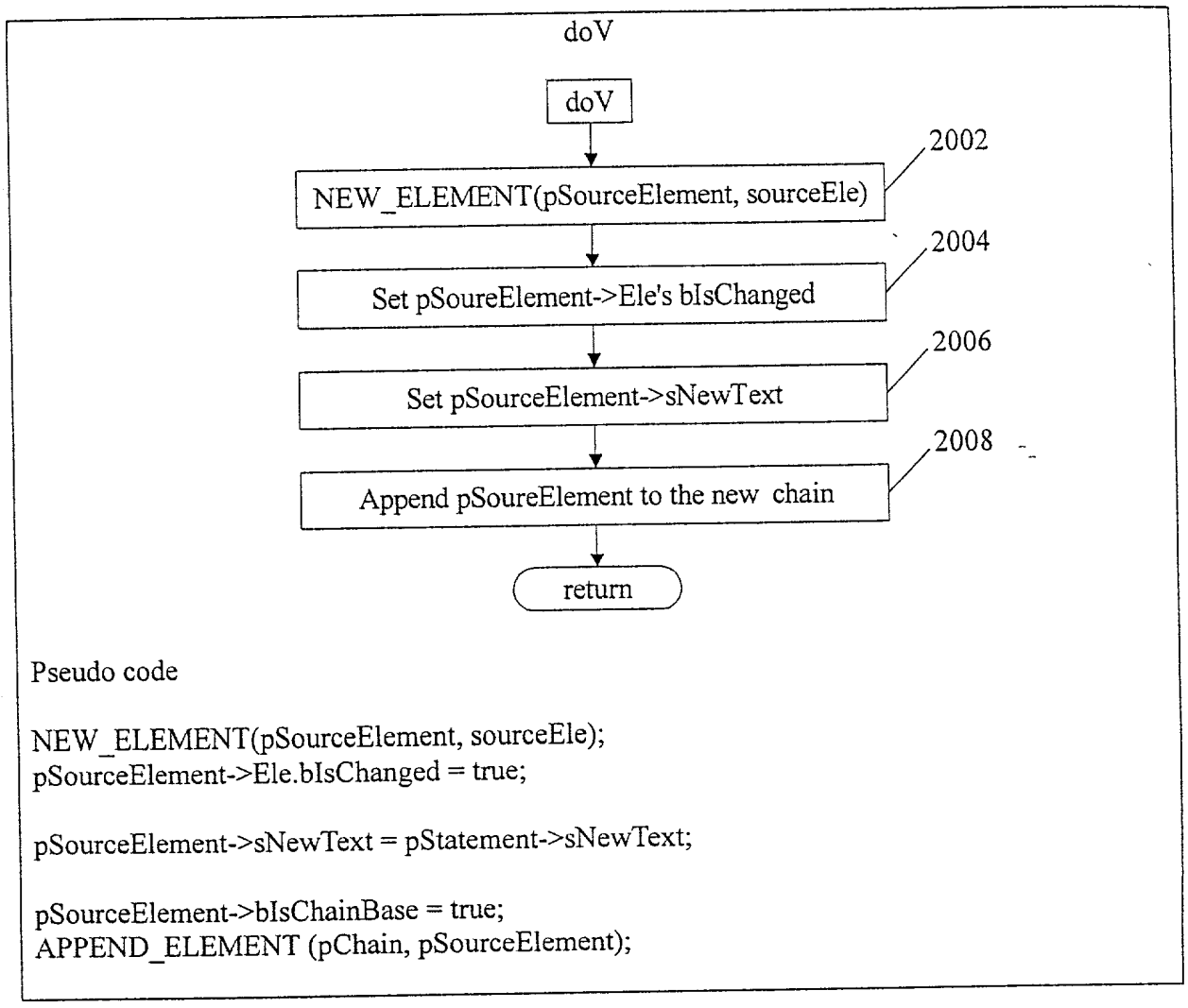

```
Pseudo code
if( ! pSourceElement ){
    NEW_ELEMENT(pSourceElement, sourceEle);
}
if(targetEle.cAbsPos){

    pSourceElement->Ele.cAbsPos = REF_ABS_POS;
    pSourceElement->Ele.sAbsPos = targetEle.sPath;
    pSourceElement->Ele.bIsChanged = true;
}
else{
    if(sourceEle.cAbsPos){
        pSourceElement->Ele.cAbsPos = NO_ABS_POS;
        pSourceElement->Ele.bIsChanged = true;
    }
}

APPEND_ELEMENT(pChain, pSourceElement);
```

FIG. 18




```
Pseudo code
//set the Element
NEW_ELEMENT(pSourceElement, sourceEle);
pSourceElement->Ele.bIsChanged = true;

//scan the attribute list
psNewAttrName = pStatement->psNewAttrName;
psNewAttrValue = pStatement->psNewAttrValue;
for(i=0;i<pStatement->iNumOfAttr; i++){
      pAttr = new Attr;
      //set the body of pAttr
      pAttr->sAttrName= psNewAttrName[i];
      pAttr->sAttrValue= psNewAttrValue[i];
      pAttr->pPrev = pAttr->pNext = NULL;

      APPEND_ATTR(pSourceElement, pAttr);
}
//append the source Element to the chain
pSourceElement->bIsChainBase = true;
APPEND_ELEMENT(pChain, pSourceElement);
```

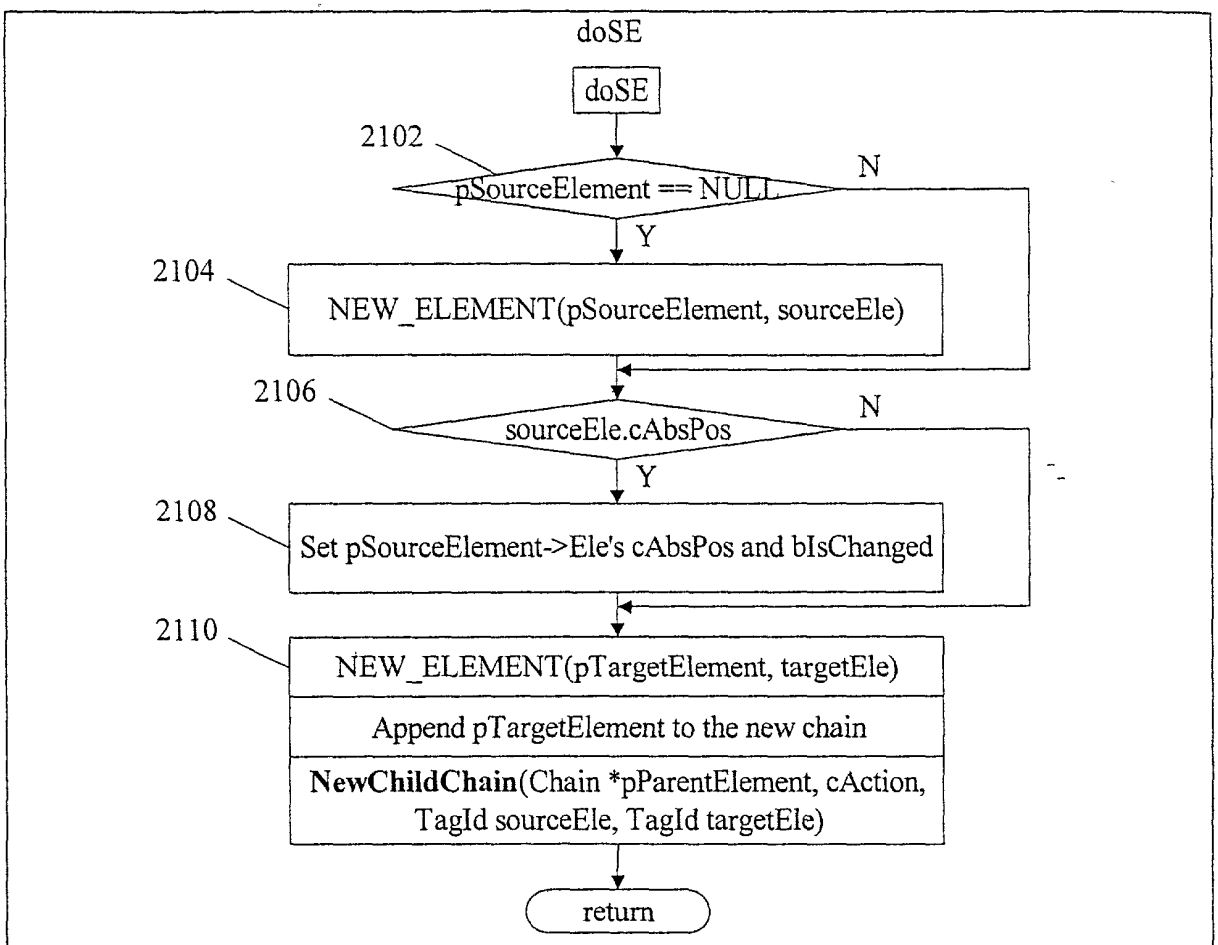
FIG. 19



Pseudo code

```
NEW_ELEMENT(pSourceElement, sourceEle);
pSourceElement->Ele.bIsChanged = true;

pSourceElement->sNewText = pStatement->sNewText;

pSourceElement->bIsChainBase = true;
APPEND_ELEMENT (pChain, pSourceElement);
```

FIG. 20



Pseudo Code

```
pTargetElement->Ele.bIsChanged = true;
if( ! pSourceElement){
    NEW_ELEMENT(pSourceElement, sourceEle);
}

if(sourceEle.cAbsPos){
    pSourceElement->Ele.cAbsPos = NO_ABS_POS;
    pSourceElement->Ele.bIsChanged = true;
}

NEW_ELEMENT(pTargetElement, targetEle);
pTargetElement->bIsChainBase = true;
APPEND_ELEMENT (pChain, pTargetElement);
NewChildChain(pTargetElement, cAction, pSourceElement);
```

FIG. 21

NewChildChain

```
Pseudo code
//New a child chain for the input Element
NEW_CHILD_CHAIN(pChain);
pParentElement->pChildChain = pChain;
pChain->pParentElement = pParentElement;
//New a empty Element
emptyEle.iFamilyId = -1;//-1 represent this is a empty Element
NEW_ELEMENT(pEmptyElement, emptyEle);

//Append two Elements according to the action
if(cAction ==‘S’){
    APPEND_ELEMENT(pChain, pSourceElement);
    APPEND_ELEMENT(pChain, pEmptyElement);
}
else{//cActio == ’E’
    APPEND_ELEMENT(pChain, pEmptyElement);
    APPEND_ELEMENT(pChain, pSourceElement);
}
```

FIG. 22

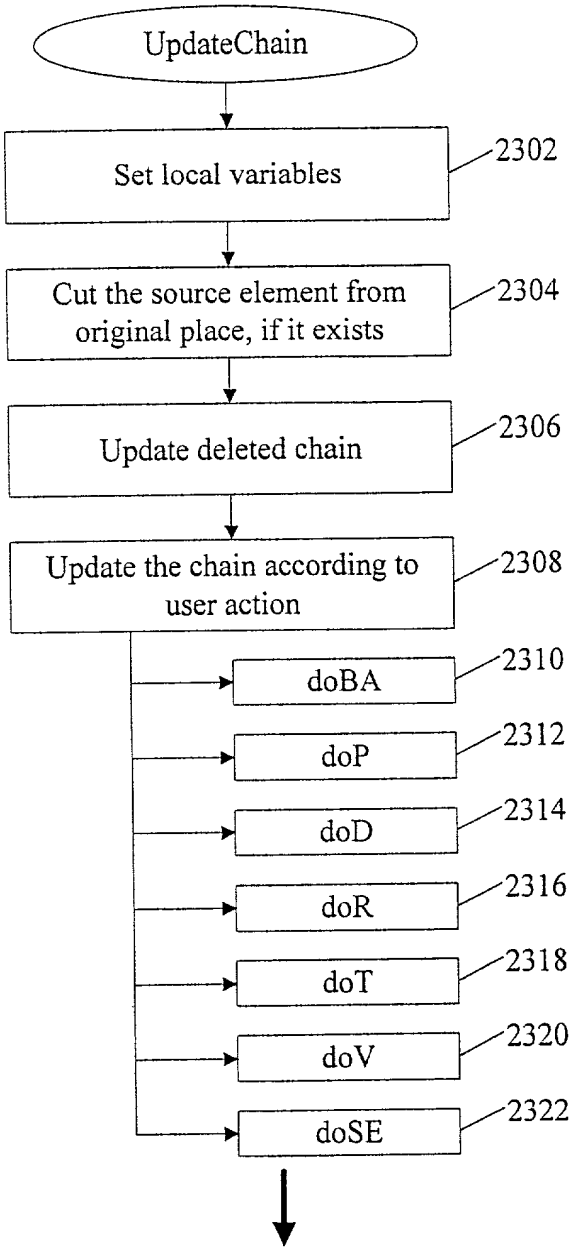

UpdateChain
Set local variables
2302
Cut the source element from original place, if it exists
2304
Update deleted chain
2306
Update the chain according to user action
2308
doBA
2310
doP
2312
doD
2314
doR
2316
doT
2318
doV
2320
doSE
2322

FIG. 23A

```
UpdateChain(1)
Step 1 Set local variables
sourceEle = pStatement->sourceEle; targetEle = pStatement->targetEle;
cAction = pStatement->cAction;
pSourceElement = pElementInfo->pSourceElement;
pTargetElement = pElementInfo->pTargetElement;

pChainForSourceEle = pElementInfo->pChainForSourceEle;
pChainForTargetEle = pElementInfo->pChainForTargetEle;

Step 2 Cut the source Element from the original place if it exists(the same as that in NewChain)
if(pSourceElement &&
    (cAction == 'B' || cAction == 'A' || cAction == 'S' || cAction == 'E' ||
    cAction == 'R' || cAction == 'D')
    ){
    //Cut the Element from the original place.
    CUT(pElementInfo->pChainForSourceEle->pFirstElement,
        pElementInfo->pChainForSourceEle->pLastElement,
        pSourceElement);
}
//other actions are PTV

Step 3 Update Deleted Chain (the same as that in NewChain)
switch(cAction){
    case 'R': UpdateDelChain(sourceEle, cAction);
              UpdateDelChain(targetEle, cAction);break;
    case 'T':
    case 'V': break;
    default: UpdateDelChain(sourceEle, cAction); break;// 'B' 'A' 'S', 'E', 'D'
    }
```

FIG. 23B

UpdateChain(2)

Step 4 Update the chain according to user action

Top level flowchart

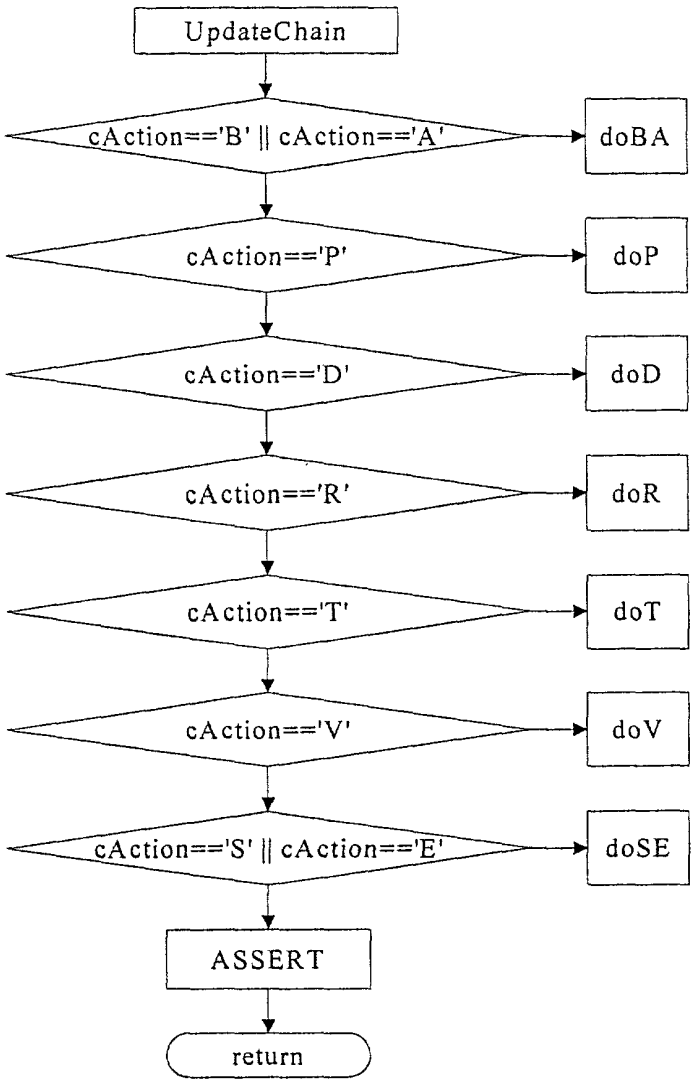


FIG. 23C

Basic rules for the above operation in UpdateChain

1. Abbreviation

Two abbreviations are defined besides the ones in NewChain

→{X}: X is an Element that is already in the current chain.

→X→~~Y~~: Replace *Element*(Y) with *Element*(X).

2. Handle different positions(the same as that in NewChain)

3. Examples

Action	What user wants to do	What Rule Generator does
B	Insert SE(RP) before TE(RP)	→SE(RP)→{TE(RP)}
	□Insert SE(RP) before TE(AP)	AP(div)=AP(TE); TE(RP)=TE(AP)-AP; →div(AP)[→SE(RP)→TE(RP)]→~~TE(AP)~~

	□Insert SE(AP) before TE(RP)	SE(RP)=SE(AP)-AP; //then SE(AP) becomes SE(RP)
		→SE(RP)→{TE(RP)}

	□Insert SE(AP) before TE(AP)	AP(div)=AP(TE); SE(RP)=SE(AP)-AP; TE(RP)=TE(AP)-AP; →div(AP)[→SE(RP)→TE(RP)]→~~TE(AP)~~ //use a div to wrap SE and TE
A	simliar as B	
P	□move SE(RP) to AP	SE(AP)=SE(RP)+AP;
	□move SE(AP) to another AP	SE(AP);
D	Delete this element	
R	Use SE(RP) to replace TE(RP)	→SE(RP)→~~TE(RP)~~;

	□Use SE(RP) to replace TE(AP)	SE(AP)=SE(RP)+AP(TE); //SE(RP) becomes SE(AP)
		→SE(AP)→~~TE(AP)~~

	□Use SE(AP) to replace TE(RP)	SE(RP)=SE(AP)-AP; //SE(AP) becomes SE(RP)
		→SE(RP)→~~TE(RP)~~

	□Use SE(AP) to replace TE(AP)	AP(SE)=AP(TE) →SE(AP)→~~TE(AP)~~
T	Change SE' attr	doD; //nothing to do with AP and RP
V	Replace SE's text	doV; //nothing to do with AP and RP
S	Insert SE(RP) to be child of TE(RP)	→{TE(RP)}[→SE(RP)→EE]
	□Insert SE(RP) to be child of TE(AP)	→{TE(AP)}[→SE(RP)→EE]
	□Insert SE(AP) to be child of TE(RP)	SE(RP)=SE(AP)-AP; →{TE(RP)}[→SE(RP)→EE]
	□Insert SE(AP) to be child of TE(AP)	SE(RP)=SE(AP)-AP; →{TE(AP)}[→SE(RP)→EE]
E	similar as S	

FIG. 23D

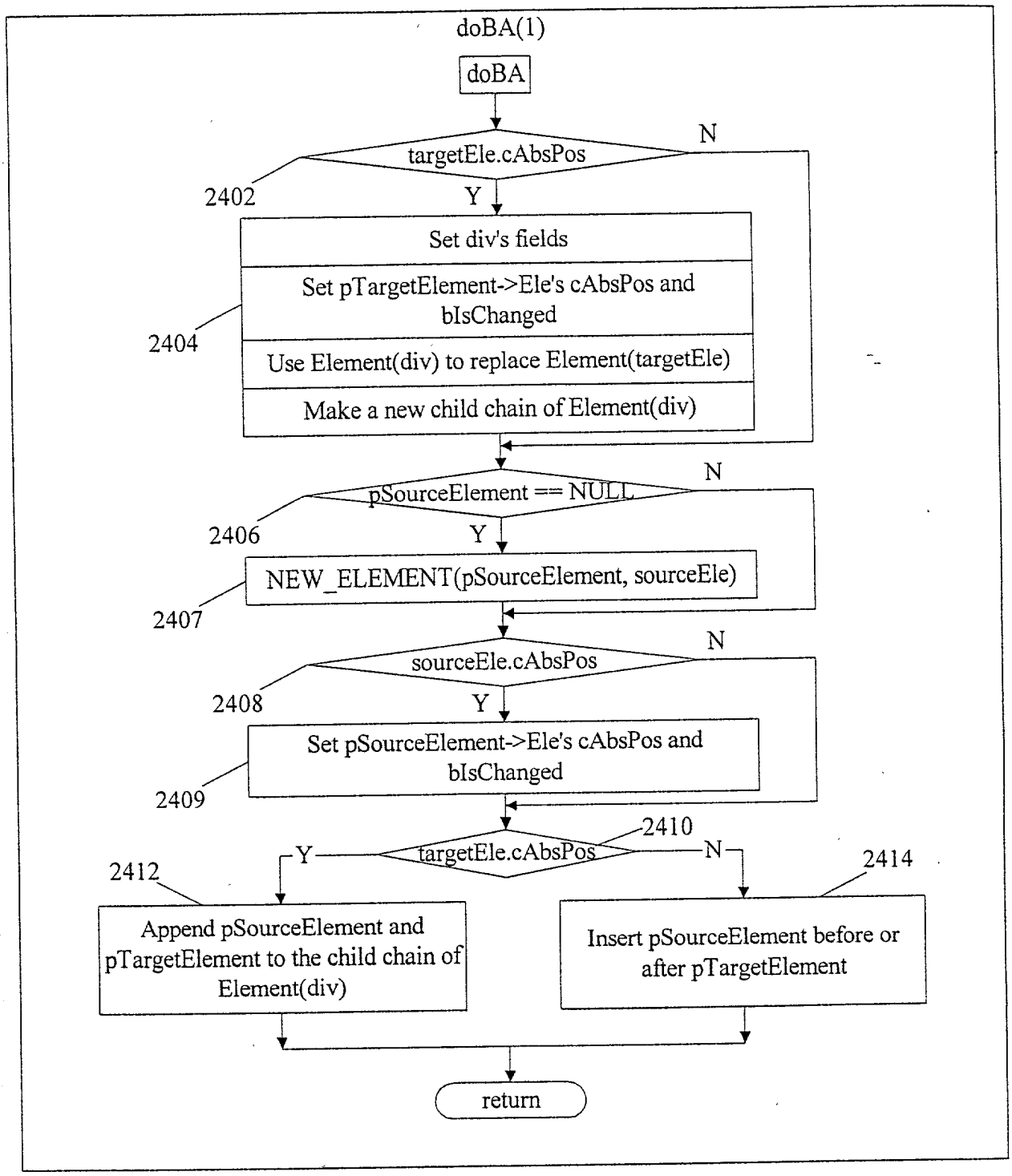

doBA(1)
doBA
targetEle.cAbsPos
N
2402
Y
Set div's fields
Set pTargetElement->Ele's cAbsPos and bIsChanged
2404
Use Element(div) to replace Element(targetEle)
Make a new child chain of Element(div)
pSourceElement == NULL
N
2406
Y
NEW_ELEMENT(pSourceElement, sourceEle)
2407
sourceEle.cAbsPos
N
2408
Y
Set pSourceElement->Ele's cAbsPos and bIsChanged
2409
2410
targetEle.cAbsPos
Y
N
2412
2414
Append pSourceElement and pTargetElement to the child chain of Element(div)
Insert pSourceElement before or after pTargetElement
return

FIG. 24A-1

doBA(1)

```
Pseudo code
//if targetEle has absolute position, a div will be used to wrap sourceEle and targetEle
//The caller of Rule Generator sets the field cAbsPos to indicate the position status of the element: absolute position or relative position
if(targetEle.cAbsPos){
    //set tag name
    div.sNewTag = "div";
    //set targetEle's absolute position attribute to div
    div.cAbsPos = targetEle.cAbsPos;
    //when cAbsPos is REF_ABS_POS, sPath is used, otherwise (x, y) is used.
    div.sAbsPos = targetEle.sAbsPos
```

FIG. 24A-2

doBA(2)

```
    div.x = targetEle.x;
    div.y = targetEle.y;
    //set targetEle.cAbsPos to NO_ABS_POS indicate that the absolute position attribute shall
not be output when xslt is applied.
    pTargetElement->Ele.cAbsPos = NO_ABS_POS;
    //set bIsChanged to indicate targetEle is changed.
    pTargetElement->Ele.bIsChanged = true;
    //new an Element for div and append to the current new chain
    NEW_ELEMENT(pDivElement, div);
    //use Element(div) to replace Element(targetEle)
    REPLACE(pChainForTargetEle->pFirstElement,      pChainForTargetEle->pLastElement,
pTargetElement, pDivElement);
    //make a new chain to be the child chain of div
    pDiveChain = new chain;
    pDivElement->pChildChain = pDivChain;
}
//if sourceEle does not exist in any chain, make a new Element for sourceEle
if( ! pSourceElement){  NEW_ELEMENT(pSourceElement, sourceEle);  }
//if sourceEle is absolute position, set bIsAbsPosOrg, cAbsPos and bIsChanged to indicate that
the absolute position attribute of sourceEle shall not be output and sourceEle is changed.
if(sourceEle.cAbsPos){
    pSourceElement->Ele.cAbsPos = NO_ABS_POS;
    pSourceElement->Ele.bIsChanged = true;
}
if(targetEle.cAbsPos){
    if(cAction == 'B'){
        APPEND_ELEMENT (pDivChain, pSourceElement);
        APPEND_ELEMENT (pDivChain, pTargetElement);
    }
    else{
        APPEND_ELEMENT (pDivChain, pTargetElement);
        APPEND_ELEMENT (pDivChain, pSourceElement);
    }
}
else{
    if(cAction == 'B'){
INSERT_BEFORE(pChainForTargetEle->pFirstElement, pSourceElement, pTargetElement);
    }
    else{
INSERT_AFTER  (pChainForTargetEle->pFirstElement,  pTargetElement,  pSourceElement);
    }
}
```

FIG. 24B

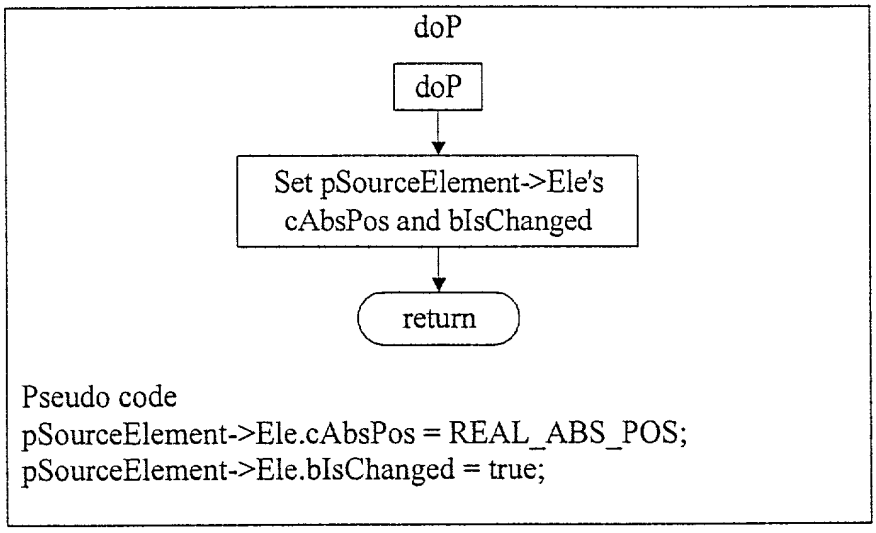
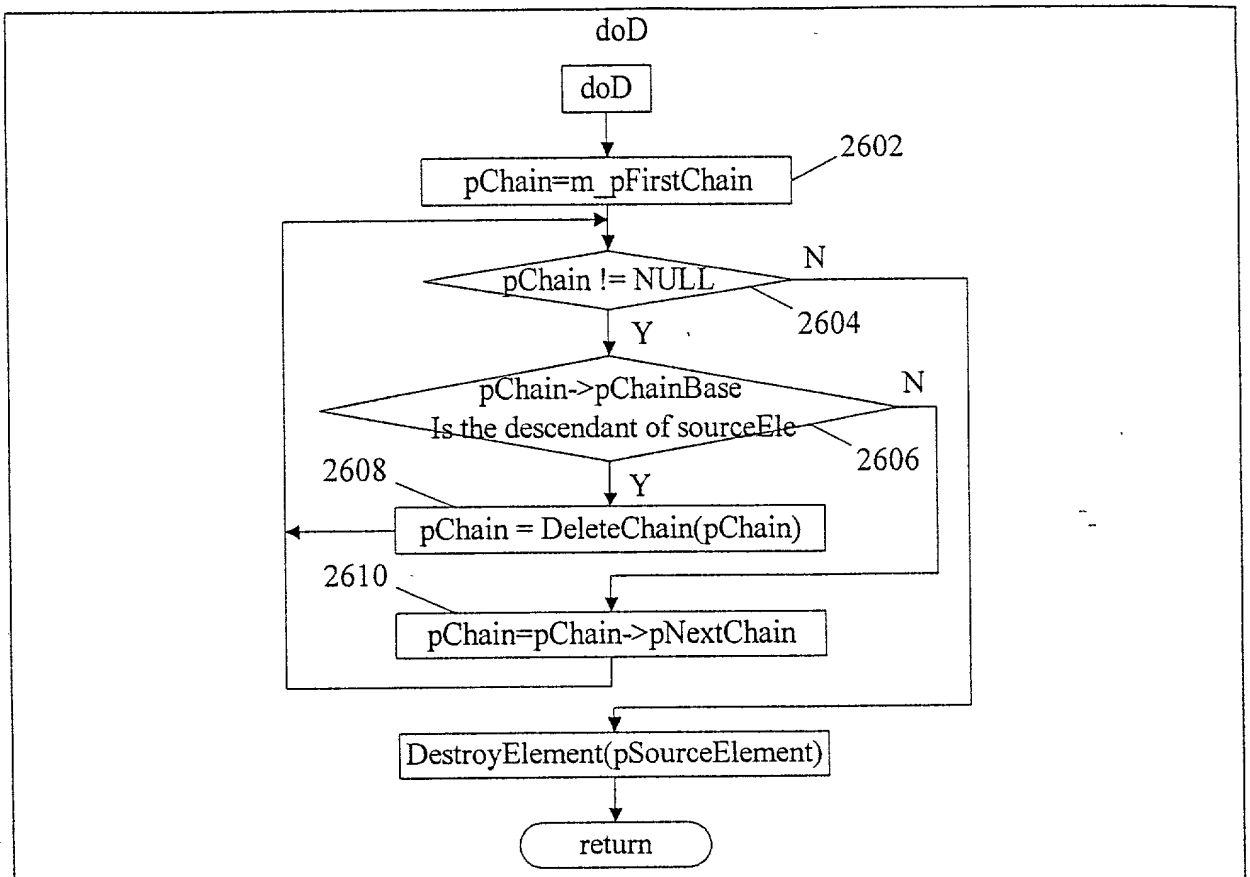

doP
doP
Set pSourceElement->Ele's
cAbsPos and bIsChanged
return
Pseudo code
pSourceElement->Ele.cAbsPos = REAL_ABS_POS;
pSourceElement->Ele.bIsChanged = true;

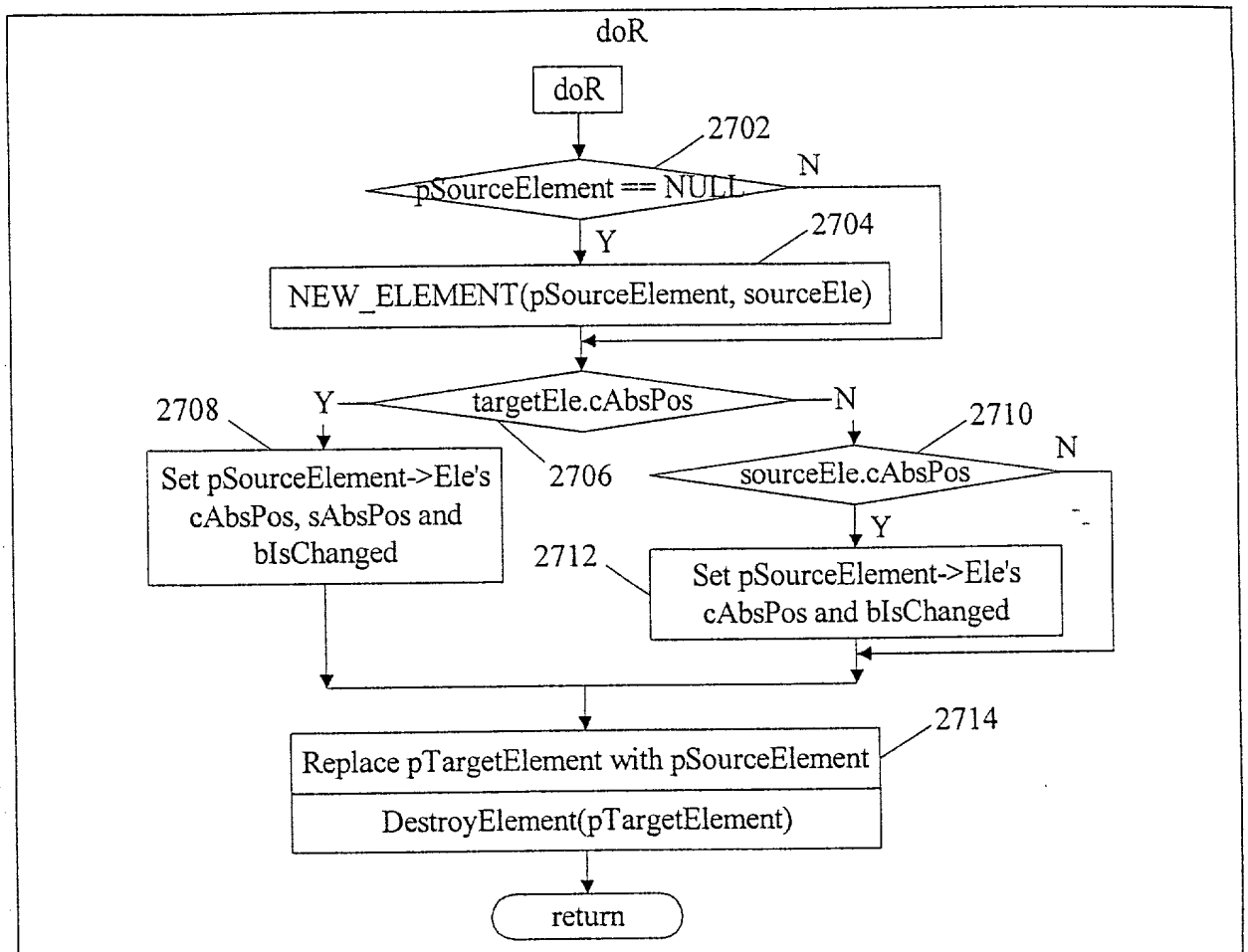
FIG. 25



Pseudo Code

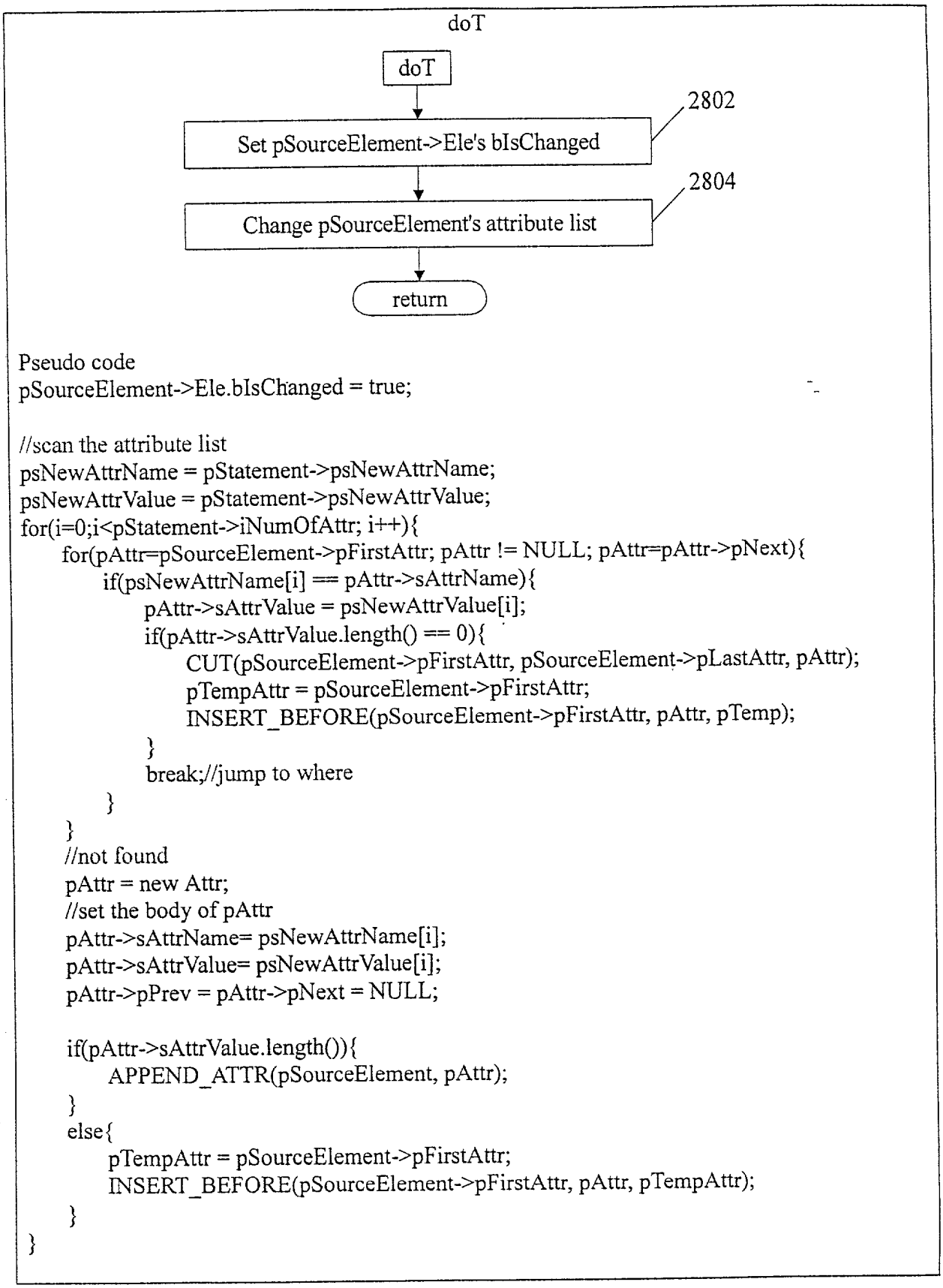
```
for(pChain = m_pFirstChain; pChain != NULL;){

    if(IS_DESCENDANT(pChain->pChainBase->Ele, pSourceElement->Ele))
        pChain = DeleteChain(pChain);//return the pointer of the next chain
    else
        pChain = pChain->pNext;
}
//pSourceElement has been cut from the original place and it is totally destroyed now.
DestroyElement(pSourceElement);
```

FIG. 26




```
Pseudo code
if( ! pSourceElement ) NEW_ELEMENT(pSourceElement, sourceEle);
if(targetEle.cAbsPos){
    //set targetEle's absolute position attribute to sourceEle
    pSourceElement->Ele.cAbsPos = targetEle.cAbsPos;
    pSourceElement->Ele.sAbsPos = targetEle.sAbsPos;
    pSourceElement->Ele.x = targetEle.x;
    pSourceElement->Ele.y = targetEle.y;
    pSourceElement->Ele.bIsChanged = true;
}
else{
    if(sourceEle.cAbsPos){
        pSourceElement->Ele.cAbsPos = NO_ABS_POS;
        pSourceElement->Ele.bIsChanged = true;
    }
}
REPLACE(pChainForTargetEle->pFirstElement,          pChainForTargetEle->pLastElement,
pTargetElement, pSourceElement)
//after replacement, pTargetElement is cut from the original place, so destroy it now.
DestroyElement(pTargetElement);
```

FIG. 27




```
Pseudo code
pSourceElement->Ele.bIsChanged = true;

//scan the attribute list
psNewAttrName = pStatement->psNewAttrName;
psNewAttrValue = pStatement->psNewAttrValue;
for(i=0;i<pStatement->iNumOfAttr; i++){
    for(pAttr=pSourceElement->pFirstAttr; pAttr != NULL; pAttr=pAttr->pNext){
        if(psNewAttrName[i] == pAttr->sAttrName){
            pAttr->sAttrValue = psNewAttrValue[i];
            if(pAttr->sAttrValue.length() == 0){
                CUT(pSourceElement->pFirstAttr, pSourceElement->pLastAttr, pAttr);
                pTempAttr = pSourceElement->pFirstAttr;
                INSERT_BEFORE(pSourceElement->pFirstAttr, pAttr, pTemp);
            }
            break;//jump to where
        }
    }
    //not found
    pAttr = new Attr;
    //set the body of pAttr
    pAttr->sAttrName= psNewAttrName[i];
    pAttr->sAttrValue= psNewAttrValue[i];
    pAttr->pPrev = pAttr->pNext = NULL;

    if(pAttr->sAttrValue.length()){
        APPEND_ATTR(pSourceElement, pAttr);
    }
    else{
        pTempAttr = pSourceElement->pFirstAttr;
        INSERT_BEFORE(pSourceElement->pFirstAttr, pAttr, pTempAttr);
    }
}
```

FIG. 28

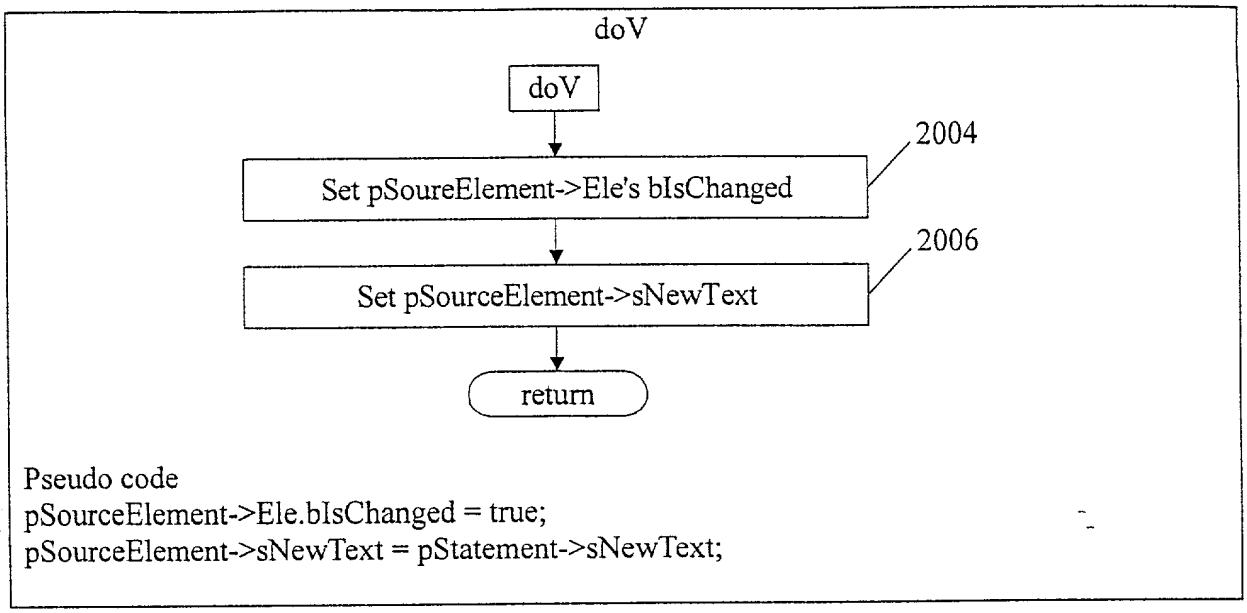
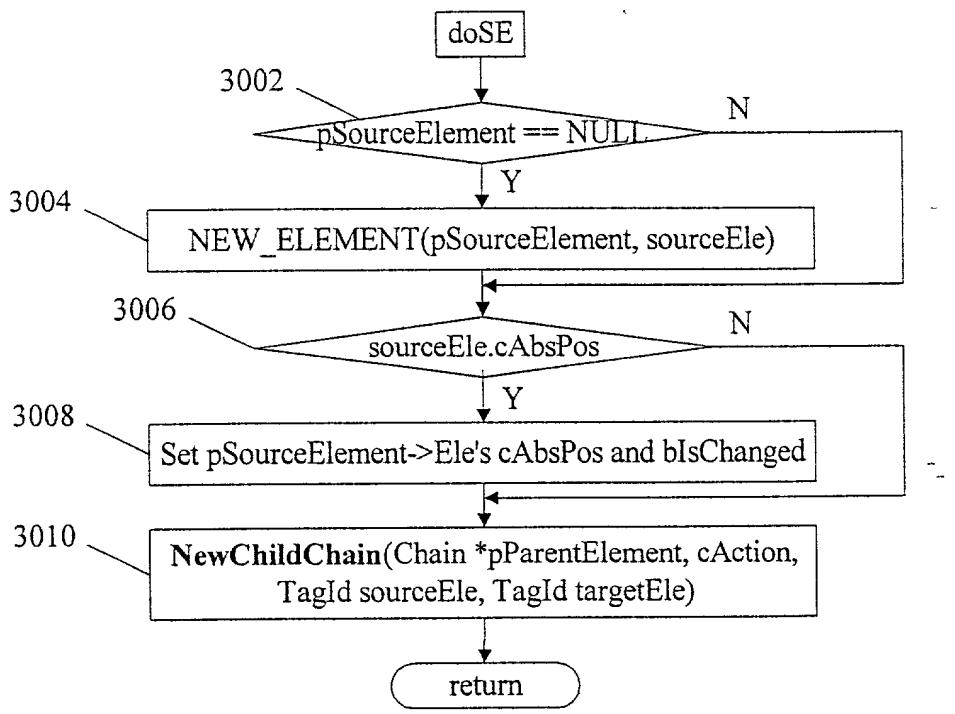

doV
doV
2004
Set pSoureElement->Ele's bIsChanged
2006
Set pSourceElement->sNewText
return
Pseudo code
pSourceElement->Ele.bIsChanged = true;
pSourceElement->sNewText = pStatement->sNewText;

FIG. 29



Pseudo code

```
pTargetElement->Ele.bIsChanged = true;

if( ! pSourceElement) NEW_ELEMENT(pSourceElement, sourceEle);
if(sourceEle.cAbsPos){
    pSourceElement->Ele.cAbsPos = NO_ABS_POS;
    pSourceElement->Ele.bIsChanged = true;
}

if(pTargetElement->pChildChain){
    if(cAction == 'S'){
        pElement = pTargetElement->pChildChain->pFirstElement;
        INSERT_BEFORE(pTargetElement->pChildChain->pFirstElement,  pSourceElement,
pElement);
    }
    else{
        APPEND_ELEMENT(pTargetElement->PchildChain, pSourceElement);
    }
}
else
    NewChildChain(pTargetElement, cAction, pSourceElement);
```

FIG. 30

```
                    UpdateDelChain
pRefElement = m_pDelChain->pFirstElement;
while(pRefElement != NULL){
    if(IS_EQUAL(pRefElement->Ele, Ele)){
        pRefElement->cAction = cAction;
        return;
    }
    pRefElement = pRefElement ->pNext;
}

NEW_ELEMENT(pElement, Ele);
APPEND_ELEMENT(m_pDelChain, pElement);
return;
```

FIG. 31

FilterDelChain

```
pCurrElement = m_DelChain->pFirstElement;
while(pCurrElement != NULL){
    if(Element is from source page){
    //look for its yougest ancestor
    bHasAncestor = false;
    pRefElement = m_pDelChain->pFirstElement;
    for( ; pRefElement != NULL; pRefElement = pRefElement->pNext) {
        if(pRefElement != pCurrElement){
            if (IS_DESCENDANT(pRefElement->Ele, pCurrElement->Ele)){
                if(bHasAncestor){
                    if(IS_DESCENDANT(pYougestAncestor->Ele, pRefElement->Ele)){
                        pYougestAncestor = pRefElement;
                    }
                }
                else{
                    bHasAncestor = true;
                    pYougestAncestor = pRefElement;
                }
            }
        }
    }
    if(bHasAncestor )
        if(pYougestAncestor->cAction != 'D')
    //Note: when put an exist Element into Deleted Chain, that action of Element is overwritten.
            pCurrElement->Ele.cAbsPos = false;//mark it not to be deleted
        else
            pCurrElement->Ele.cAbsPos = true;
    else
        pCurrElement->Ele.cAbsPos = true;//has no ancestor, mark it to be deleted later
    }//if(element is in source page
    else
        pCurrElement->Ele.cAbsPos = false;
    pCurrElement = pCurrElement->pNext;
}

//Remove Elements whose cAbsPos = true
pCurrElement=m_pDelChain->pFirstElement;
while(pCurrElement != NULL){
    if(pCurrElement->Ele.cAbsPos)
        pCurrElement=DeleteElement(&m_DelChain, pCurrElement);
    else
        pCurrElement=pCurrElement->pNext;
}
```

FIG. 32

AssemblyChain

```
//Assembly chains cards and pages according to the field iPage and iCard of structure TagId
for( pChain = m_pFirstChain; pChain != NULL; pChain = pChain->pNext){
    for(pPage = m_pFirstPage; pPage != NULL; pPage = pPage->pNext){
        if(pChain->pChainBase->Ele.iPage == pPage->iPage){
            for( pCard = pPage->pFirstCard; pCard != NULL; pCard = pCard->pNext){
                if(pChain->pChainBase->Ele.iCard == pCard->iCard){
                    CUT(m_pFirstChain, m_pLastChain, pChain);
                    APPEND_CHAIN_TO_CARD(pCard, pChain);

                    if(pCard->iEntry == HAS_NOT_ENTRY)
                        pCard->iEntry = pChain->pChainBase->Ele.iFamilyId;
                    goto NEXT_CHAIN;
                }
            }
        }
    }
    NEW_PAGE(pPage, pChain->pChainBase->Ele.iPage)
    APPEND_PAGE(this, pPage);
    NEW_CARD(pCard, pChain->pChainBase->Ele.iCard);
    APPEND_CARD(pPage, pCard);
    CUT(m_pFirstChain, m_pLastChain, pChain);
    APPEND_CHAIN_TO_CARD(pCard, pChain);

    if(pCard->iEntry == HAS_NOT_ENTRY){
        pCard->iEntry = pChain->pChainBase->Ele.iFamilyId;
NEXT_CHAIN: ;
}
//Assembly Elements in Deleted Chains according to FamilyId.
for(pElement = m_pDelChain->pFirstElement; pElement != NULL; pElement = pElement-
>pNext){
    for(pChain = m_pFirstDelChain; pChain != NULL; pChain = pChain->pNext){
        if(pElement->Ele.iFamilyId == pChain->pFirstElement->Ele.iFamilyId){
            CUT(m_pDelChain->pFirstElement, m_pDelChain->pLastElement, pElement);
            APPEND_ELEMENT(pChain, pElement);
            goto NEXT_DEL_ELEMENT;
        }
    }
    NEW_CHILD_CHAIN(pChain);
    APPEND_DEL_CHAIN(pChain);
    CUT_ELEMENT(m_pDelChain->pFirstElement, m_pDelChain->pLastElement, Element);
    APPEND_ ELEMENT(pChain, pElement);
NEXT_DEL_ELEMENT:;
}
```

FIG. 33

ParseFrame(1)

```
if(pChain->pChainBase)
    pElement = pChain->pChainBase;
else
    pElement = pChain->pFirstElement;

bTmpHasFrame = bSrcHasFrame = true;

while(pElement != NULL && (bSrcHasFrame || bTmpHasFrame)){

    if(pElement->bIsChainBase) bChainBaseIsFound = true;

    if(pElement->Ele.sPath.charAt(0) == 't'){
            cFrom = TEMPLATE;
        if(bTmpHasFrame)
            pVar = pPage->pRootTmpVar;
        else
            goto NEXT_ELEMENT;
    }
    else if(pElement->Ele.sPath.charAt(0) == 's'){
        cFrom = SOURCE;
        if(bSrcHasFrame)
            pVar = pPage->pRootSrcVar;
        else
            goto NEXT_ELEMENT;
    }
    else{
        //DEBUG
        printf("wrong path!\n");
    }

    sFrame = pElement->Ele.sFrame;
    iMaxLayer = GetLayerNumber(sFrame);
```

FIG. 34A

ParseFrame(2)

```
for(i=0;i<iMaxLayer;i++){

    iFirstDotPos = GetFirstCharPos(sFrame, '.');

    if(iFirstDotPos != -1){
        sTemp = sFrame.substringData(0, iFirstDotPos);
        sFrame = sFrame.substringData(iFirstDotPos+1, sFrame.length()-iFirstDotPos);
    }
    else
        sTemp = sFrame;

    if(sTemp.charAt(0) == 'i'){
        bIsFrame = false;
        sTemp = sTemp.substringData(1, sTemp.length()-1);
    }
    else
        bIsFrame = true;

    if(sTemp.length() == 0){//the page containing this element has no frame.
        if(cFrom == TEMPLATE)
            bTmpHasFrame = false;
        else
            bSrcHasFrame = false;

        goto NEXT_ELEMENT;
    }
    else
        iFrameIndex = atoi(sTemp.transcode());

    if(bIsFrame){
        if(iFrameIndex < pVar->iMaxFrame){
            pVar = pVar->pFirstFrame;
            for(i=1;i<iFrameIndex; i++){
                pVar = pVar->pNext;
            }
            goto NEXT_ELEMENT;
        }
        else{
            for(j = pVar->iMaxFrame; j < iFrameIndex; j++){
                itoa(j+1, szBuffer, 10);
                sCurrFrame = szBuffer;
```

FIG. 34B

```
                                        ParseFrame(3)
                    if(pVar != pPage->pRootSrcVar && pVar != pPage->pRootTmpVar)
                        sCurrFrame = pVar->sFrame + "." + sCurrFrame;

                    NEW_VAR(pNewVar, ScurrFrame);
                    APPEND(pVar, pNewVar, Frame);
                }//loop for j
                pVar->iMaxFrame = iFrameIndex;
                pVar = pVar->pLastFrame;
            }
        }
        else{
            if(iFrameIndex < pVar->iMaxIFrame){
                pVar = pVar->pFirstIFrame;
                for(i=1;i<iFrameIndex; i++){
                    pVar = pVar->pNext;
                }
                goto NEXT_ELEMENT;
            }
            else{
                for(j = pVar->iMaxIFrame; j < iFrameIndex; j++){
                    itoa(j+1, szBuffer, 10);
                    sCurrIFrame = szBuffer;

                    if(pVar != pPage->pRootSrcVar && pVar != pPage->pRootTmpVar)
                        sCurrFrame = pVar->sFrame + "." + sCurrFrame;

                    NEW_VAR(pNewVar, sCurrIFrame);
                    APPEND(pVar, pNewVar, IFrame);
                }
                pVar->iMaxIFrame = iFrameIndex;
                pVar = pVar->pFirstIFrame;
            }
        }
        pVar->bToOutput = true;
    }
NEXT_ELEMENT:

    if(pChain->pChainBase == pElement)
            pElement = pChain->pFirstElement;
    else
        pElement = pElement->pNext;
}//end of loop for pElement
```

FIG. 34C

```
                                    OutputVar
if(pVar->bToOutput == false) return;

if(pVar->sFrame contains the character '.'){
    iLastDotPos = pVar->sFrame.lastIndexOf(pVar->sFrame, '.');
    iLength = pVar->sFrame.length();

    sParentFrame = pVar->sFrame.substringData(0, iLastDotPos);
    sSelfFrame = pVar->sFrame.substringData(iLastDotPos + 1, iLength - iLastDotPos-1);
}
else{
    sParentFrame = "";
    sSelfFrame = pVar->sFrame;
}

if(the first character of sSelfFrame is 'i'){
    //it is a "iframe"
    bIsIFrame = true;
    sSelfFrame = pVar->sFrame.substringData(iLastDotPos + 1, iLength - iLastDotPos - 1);
}

//Set frame type
sFrameType = bIsFrame ? "iframe" : "frame"

//Output the variable for this frame
←<xsl:variable name="sFrom pVar->sFrame" select="document($"
        sFrom sParentFrame//sFrameType [ SselfFrame ]/@src)"/>

//Iteratively output the XSLT variables for the frames of the current var
for(pFrame = pVar->pFirstFrame; pFrame ; pFrame = pFrame->pNext){
    OutputVar(xsltFile, pFrame, sFrom);
}
//Iteratively output the XSLT variables for the iframes of the current var
for(pIFrame = pVar->pFirstIFrame; pIFrame ; pIFrame = pIFrame->pNext){
    OutputVar(xsltFile, pIFrame, sFrom);
}
```

FIG. 35

OutputChain

```
pElement = pChain->pFirstElement;

bChainBaseIsFound = false;

while(pElement){
    if(pElement->bIsChainBase)  bChainBaseIsFound = true;

    if(pElement->Ele.iFamilyId != EMPTY_ELEMENT){

        szRoot = ((pElement->Ele.sPath.substringData(0, 3))
                + (pElement->Ele.sFrame)).transcode();
        <-<xsl:apply-templates select="szRoot sPath"
                mode="szRoot _output_ pElement->Ele.iFamilyId"/>

        NEW_UNIT(pUnit, pElement);

        if(pElement->Ele.bIsChanged == true || pElement->Ele.sNewTag.length()!=0)
            //this Element is changed
            APPEND_UNIT(pCard, pUnit);//the Queue will be scanned later
        }
        else{
            APPEND_UNIT_TO_FAMILY(pCard, pUnit);
        }
    }
    else{//it is the empty Element which is the content of the parent Element of this chain
        szRoot = ((pChain->pParentElement->Ele.sPath.substringData(0, 3))
                + (pChain->pParentElement->Ele.sFrame)).transcode();
        <-<xsl:apply-templates select="*|text()" mode="szRoot _test_
                pChain->pParentElement->Ele.iFamilyId"/>
    }
    pElement = pElement->pNext;
}//end of while

//if the chain has chain base and the chain base is not in the chain (i.e. it is moved to other chains
or it is deleted), append the chain base to family according to it family id.
if(!bChainBaseIsFound && pChain->pChainBase){
    NEW_UNIT(pUnit, pChain->pChainBase);
    APPEND_UNIT_TO_FAMILY(pCard, pUnit);
}
```

FIG. 36

GetUnit

```
if(pCard->pFirstUnit){
      pUnit = pCard->pFirstUnit;
      pElement = pCard->pFirstUnit->pElement;
      pCard->pFirstUnit = pCard->pFirstUnit->pNext;
      pCard->pFirstUnit->pPrev = NULL;
      free(pUnit);
      return pElement;
}
else
      return NULL;
```

FIG. 37